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A Scientific Paper of the **FISHERY BULLETIN**

Description of Economic Data Collected with a Random Sample of Commercial Reef Fish Boats in the Florida Keys

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ABSTRACT—This study summarizes the results of a survey designed to provide economic information about the financial status of commercial reef fish boats with homeports in the Florida Keys. A survey questionnaire was administered in the summer and fall of 1994 by interviewers in face-to-face meetings with owners or operators of randomly selected boats. Fishermen were asked for background information about themselves and their boats, their capital investments in boats and equipment, and about their average catches, revenues, and costs per trip for their two most important kinds of fishing trips during 1993 for species in the reef fish fishery. Respondents were characterized with regard to their dependence on the reef fish fishery as a source of household income. Boats were described in terms of their physical and financial characteristics. Different kinds of fishing trips were identified by the species that generated the greatest revenue. Trips were grouped into the following categories: yellowtail snapper (*Ocyurus chrysurus*); mutton snapper (*Lutjanus analis*), black grouper (*Mycteroperca bonaci*), or red grouper (*Epinephelus morio*); gray snapper (*Lutjanus griseus*); deeper water groupers and tilefishes; greater amberjack (*Seriola dumerili*); spiny lobster (*Panulirus argus*); king mackerel (*Scomberomorus cavalla*); and dolphin (*Coryphaena hippurus*). Average catches, revenues, routine trip costs, and net operating revenues per boat per trip and per boat per year were estimated for each category of fishing trips. In addition to its descriptive value, data collected during this study will aid in future examinations of the economic effects of various regulations on commercial reef fish fishermen.

Description of Economic Data Collected with a Random Sample of Commercial Reef Fish Boats in the Florida Keys

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Introduction

Bays, coral reefs, and offshore waters of the Florida Keys support commercial and recreational fisheries for reef fishes and other species. Many of the reef fishes, including snappers (*Lutjanidae*), groupers (*Serranidae*), porgies (*Sparidae*), grunts (*Haemulidae*), triggerfishes (*Balistidae*), wrasses (*Labridae*), tilefishes (*Malacanthidae*), and jacks (*Carangidae*), are vulnerable to overfishing because of their life history characteristics that include relatively sedentary behavior, slow growth, low natural mortality, large body size, delayed reproduction, and sex reversal for some species (SEFSC, 1992). As a result, the Florida Marine Fisheries Commission[1], the South Atlantic Fishery Management Council[2], and the Gulf of Mexico Fishery Management Council[3] have implemented regulations to conserve and rebuild depleted populations of reef fishes.

Scarcity of economic data has been a problem in the development of regulations for reef fishes. Data about total pounds landed and total ex-vessel value are available[4], but there is little information about the financial performance of commercial reef fish boats or the economic effects of proposed regulations. This report presents results from a recent survey that collected basic economic information about commercial fishing for reef fishes in the Florida Keys. Our objectives are to develop a stratified random survey of commercial reef fish boats with homeports in the Florida Keys; summarize characteristics of respondents and their boats; and estimate average catches, revenues, routine harvesting costs, and net operating revenues per trip and per year for commercial reef fish boats. The information presented here will be

[1] Florida Fish and Wildlife Conservation Commission. 1999. Marine Fisheries Regulations [Management Plans]. Internet website available at http://marinefisheries.org/mfc46.htm.

[2] South Atlantic Fishery Management Council. 1983. Fishery Management Plan, Regulatory Impact Review, and Final Environmental Impact Statement for the Snapper-Grouper Fishery of the South Atlantic Region. One Southpark Circle, Southpark Building, Suite 306, Charleston, S.C. 29407.

[3] Gulf of Mexico Fishery Management Council. 1981. (Revised) Environmental Impact Statement and Fishery Management Plan for Reef Fish Resources of the Gulf of Mexico. Lincoln Center, Suite 881, 5401 West Kennedy Boulevard, Tampa, FL 33609.

[4] Data are maintained by the Office of Fisheries Statistics, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, FL 33149.

made available to fishery managers to assist in their assessments of the consequences of proposed regulations for the commercial reef fish fishery.

This report is the third in a series of three about economic surveys of the commercial reef fish fisheries in the southeastern United States. Waters[5] reported on a similar survey of 196 commercial reef fish boats in the Gulf of Mexico. Waters, Rhodes, Waltz, and Wiggers[6] described a survey of 147 commercial snapper-grouper boats along the Atlantic coast from North Carolina to south Florida. In an unrelated survey, Suman and Shivlani[7] interviewed 337 fishermen in the Florida Keys to examine where they fished during 1995 in relation to the Florida Keys National Marine Sanctuary and to estimate species caught, relative effort in various fisheries, and trip costs per fishery.

Materials and methods

Our survey consisted of three questionnaires (see Appendix 1). First, a screening questionnaire was used to record each attempt to telephone owners of randomly selected boats, verify their boat's eligibility for inclusion in the survey, and set up an appointment for a face-to-face interview with the owner or operator. Second, the basic questionnaire was used to obtain background information about respondents and their boats and to identify the primary species caught during the year. Third, supplemental questionnaires were used to obtain detailed information about average catches, revenues, and costs per trip for each boat's two most important kinds of trips for reef fishes in terms of their contributions to annual revenues. If a boat made only one kind of trip for reef fish, then a second supplemental questionnaire was administered regarding the most important kind of non-reef fishing trips, if any. We decided to collect supplemental information about only two kinds of fishing trips per boat as a way to limit the length of each interview, although it reduced the amount of resulting information about the profitability of fishing alternatives for boats that engaged in three or more kinds of fishing trips. Interviews were performed under subcontract by Roper Starch Worldwide, Inc., a firm that specializes in research surveys for both the public and private sectors.

Sampling design

The Florida Keys, by virtue of their unique location between the Atlantic Ocean and Gulf of Mexico, establish the boundary between the federal jurisdictions of the South Atlantic and Gulf of Mexico Fishery Management Councils. The South Atlantic Fishery Management Council has responsibility for management of fisheries in federal waters south and east of the Florida Keys, whereas the Gulf of Mexico Fishery Management Council has jurisdiction in federal waters west and north of the Keys. Depending on where they fish, fishermen may have to comply with regulations established by one or both regional fishery management councils, as well as the state of Florida which manages fisheries in state waters.

To fish commercially for reef fishes in federal waters, both regional fishery management councils require permits. The National Marine Fisheries Service (NMFS) issues reef fish permits for boats that fish commercially for reef fishes managed by the Gulf Council under its Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico.[8] NMFS issues snapper-grouper permits for boats that fish commercially for reef fishes managed by the South Atlantic Council under its Fishery Management Plan for the Snapper-Grouper Fishery of the south Atlantic Region.[9] The primary criterion to obtain a Gulf reef fish permit is that at least 50% of total earned income must come from commercial fishing, but not necessarily from reef fish fishing. The primary criterion to qualify for an Atlantic snapper-grouper permit is that at least 50% of total earned income or at least $20,000 in gross revenues must come from commercial fishing, but not necessarily from reef fish fishing. Permits are issued annually.

We established the population of boats to be sampled from data files that recorded boats with permits for the Atlantic snapper-grouper and Gulf reef fish fisheries.[10]

[5] Waters, James R. 1996. An economic survey of commercial reef fish vessels in the U.S. Gulf of Mexico. Unpubl. report for the National Marine Fisheries Service, 101 Pivers Island Road, Beaufort, NC 28516.

[6] Waters, James R., Raymond J. Rhodes, Wayne Waltz, and Robert Wiggers. 1997. An economic survey of commercial reef fish boats along the U.S. south Atlantic coast. Unpubl. report for the National Marine Fisheries Service, 101 Pivers Island Road, Beaufort, NC 28516.

[7] Suman, D. O., and M. P. Shivlani. 1997. Catch and effort profiles of commercial fishermen in the Florida Keys National Marine Sanctuary. Unpubl. report of the Division of Marine Affairs and Policy, Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149.

[8] Gulf of Mexico Fishery Management Council. 1989. Amendment Number 1 to the Reef Fish Fishery Management Plan. 3018 U.S. Highway 301 North, Suite 1000, Tampa, FL 33619.

[9] South Atlantic Fishery Management Council. 1991. Amendment 4, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region. One Southpark Circle, Suite 306, Charleston, SC 29407.

[10] Data were obtained from the Fisheries Permits Team, National Marine Fisheries Service, Southeast Regional Office, 9721 Executive Center Drive North, St. Petersburg, FL 33702. The terms "boats" and "vessels" are used interchangeably in this report.

There were 811 boats with homeports in the Florida Keys that held either an Atlantic snapper-grouper permit, a Gulf reef fish permit, or both during 1993. The owners of most boats with federal permits apparently expected to fish on the Atlantic side of the Keys, or in both Atlantic and Gulf waters, but few expected to fish only in the Gulf of Mexico. Three hundred four boats held both an Atlantic snapper-grouper permit and a Gulf reef fish permit, 479 boats held a snapper-grouper permit and no reef fish permit, and only 28 boats held a reef fish permit and no snapper-grouper permit.

Given the project's limited budget, the survey was designed to reduce the chance of randomly selecting boats with minimal levels of participation in the fishery during the 1993 survey period.[11] We excluded boats whose owners let their permits expire during the first three months of 1993 or that obtained a new permit during the last three months of 1993. We further reduced the size of the sampling universe by focusing on gear types commonly used on boats in the snapper-grouper and reef fish fisheries. Applicants for federal permits were asked to:

"Select by letter up to four gears used by this vessel (1. Most important - 4. Least important)

1. _____	3. _____
2. _____	4. _____
a. Shrimp trawl	g. Surface longline
b. Fish trap/pot	h. Bottom longline
c. Runaround gillnet	i. Lobster trap
d. Reef fish bandit	j. Diver
e. Hand/troll line	k. Other (specify)
f. Rod & reel	_____."

Boats with applications that reported the use of fish traps (choice b), vertical lines with bandit reels (d), rods and reels (f), bottom longlines (h), or diving gear (j) as among their top four gear choices were retained in the sampling universe.

The total population to be sampled consisted of 653 boats with homeports in the Florida Keys that, for at least three months during 1993, held an Atlantic snapper-grouper and/or a Gulf reef fish permit to fish commercially for reef fishes in federal waters and that also claimed on their permit applications the use of one or more common reef fish gears in their commercial fishing activities. Other boats in the Keys that fished commercially or recreationally for reef fishes or other species but did not meet these conditions were not included in the sampling universe.

Table 1

Final sample design and sampling outcome for the Florida Keys.

	Upper Keys	Middle Keys	Lower Keys	Total
Boats in population	112	163	378	653
Percent of total	17	25	58	100
Planned sample	17	25	58	100
Boat owners contacted				
Completed interviews	21	24	57	102
Eligible but refused	9	6	19	34
Did not fish in 1993	6	17	31	54
Reef fish < 5% of annual boat revenues	1	6	9	16
Total	37	53	116	206
Unsuccessful attempted contacts				
Not found	6	5	21	32
Deceased	0	0	2	2
Total	6	5	23	34
Estimated number of boats eligible for inclusion in survey	91	92	248	431

Boats in the population to be sampled were stratified by homeport area as reported on their permit applications. Boats with homeports between Bahia Honda and Long Key were allocated to the Middle Keys region. Boats with homeports to the northeast of Long Key were allocated to the Upper Keys region, and boats with homeports southwest of Bahia Honda were allocated to the Lower Keys region. There were 112 boats (17% of the population of boats to be sampled) in the Upper Keys, 163 boats (25%) in the Middle Keys, and 378 boats (58%) in the Lower Keys.

The survey design called for a stratified random sample of 100 boats, with the planned number of interviews to be proportional to the total number of boats in each area. Hence, the sample design called for 17 interviews in the Upper Keys, 25 interviews in the Middle Keys, and 58 interviews in the Lower Keys (Table 1). Boats within each stratum were randomly ordered, and interviewers attempted to schedule meetings with boat owners or operators about their boat's fishing operations according to their position in the randomly ordered lists. Interviewers were instructed to make at least eight attempts to contact boat owners before selecting a replacement boat from the list. Owners of 32 boats could not be located and 2 others were deceased (Table 1).

Upon successfully contacting a boat owner, interviewers were instructed to determine if the owner actively

[11] We would have preferred to have had access to a list of boats that actively participated in the reef fish fishery, and if the survey were to be repeated, we would use logbook trip reports as the basis for the sampling universe. However, the logbook program on the Atlantic had recently begun at the time of this survey and the NMFS was still working to improve the industry's awareness of the reporting requirements.

participated in the reef fish fishery in the Keys, with active participation defined as 5% or more of annual revenues having been earned from the sale of reef fishes. Seventy boats were contacted and ruled ineligible for inclusion in the survey: 54 did not land reef fishes during 1993 due to an owner's illness or the boat having been in disrepair, sold, or having fished for other species; and 16 did not earn at least 5% of their annual revenues from the sale of reef fishes (Table 1). Thirty-four additional boats were eligible for inclusion in the survey but refused to schedule an interview.

The final sample consisted of interviews about the operations of 102 boats: 21 in the Upper Keys, 24 in the Middle Keys, and 57 in the Lower Keys (Table 1). Primary cities of residence for respondents in the Upper Keys included Islamorada (9 respondents), Tavernier (7), and Key Largo (4); in the Middle Keys included Marathon (21) and Long Key (3); and in the Lower Keys included Key West (24), Big Pine Key (17), and Summerland Key (13).

Statistical methods

This study describes economic characteristics of boats that actively participated in the reef fish fishery, as defined by the 5% eligibility criterion for inclusion in the survey. Responses from the screening questionnaire were used to estimate the number of boats that actively participated in the reef fish fishery as the ratio of boats eligible for the survey to the total number of boats contacted, with the ratio multiplied by the number of boats in the sampling universe. It was estimated that approximately 81% (30 of 37) of the boats in the Upper Keys, 57% (30 of 53) of the boats in the Middle Keys, and 66% (76 of 116) of the boats in the Lower Keys actively participated in the reef fish fishery (Table 1). The estimated number of eligible boats was 91 with a standard error of 6 in the Upper Keys, 92 with a standard error of 9 in the Middle Keys, and 248 with a standard error of 14 in the Lower Keys.

Responses from the basic questionnaire were summarized by area, with area defined as the Upper, Middle, and Lower Keys, and for all areas combined. Equations for stratum means and standard errors were obtained from sampling texts by Cochran (1977) and Thompson (1992). Equations for stratum totals and standard errors were adapted from Cochran's (1977) discussion of double sampling because the total number of active boats in the population had to be estimated.[12] Phase 1 in the double sampling context consisted of the telephone screening portion of the survey which gathered information about each boat's eligibility for inclusion in the survey. The phase 2 subsample consisted of eligible (i.e., active) boats.

Responses from the supplemental questionnaire about each kind of fishing trip were grouped into selected subpopulations, such as trips on which boats caught primarily yellowtail snapper, regardless of stratum. Equations with which to estimate the average response by boats within each subpopulation were obtained from Cochran (1977) and modified to account for the extra variance associated with having to estimate the total number of active boats in each stratum.

It was assumed that non-respondents were not different from respondents, although this assumption was not tested due to a lack of prior information. Differences in the rates of non-response across strata are accounted for in the weighting scheme used to estimate overall population means and totals and their standard errors. However, the assumption remains that non-respondents were not different from respondents within each stratum.

The survey was structured and responses interpreted to minimize the potential for recall bias that could occur since fishermen were asked about their fishing activities and financial performance at the end of the year. Face-to-face interviews usually were scheduled at each fisherman's place of business so that financial records could be examined, especially for fixed costs and other infrequently incurred costs. In addition, respondents were asked about their average revenues and costs per trip rather than an exact accounting of revenues and costs for specific trips. Averages were easier to provide and are interpreted as expectations of revenues and costs based on the respondent's fishing experience throughout the year. Fishermen must make decisions about embarking on additional trips based on their anticipated revenues and costs although actual revenues and costs may differ at the conclusion of any specific trip.

Results

Characteristics of respondents

Respondents ranged in age from 22 to 82 years, with the overall average age being 52 years (Table 2). There were 17 respondents between 30 and 39 years of age, 19 respondents in the 40–49 year age group, 25 respondents in the 50–59 year age group, and 24 respondents in the 60–69 year age group. Six respondents were younger than 30, and eleven were 70 or older. On average, respondents in the Upper Keys were significantly younger than respondents in the Middle and Lower

[12] Richard S. Sigman of the U.S. Bureau of the Census, Economic Statistical Methods and Programming Division, pointed out the relevance of double sampling to this survey and derived the equation for the variance of stratum totals.

Table 2

Estimated means, medians, and standard errors of the means for selected characteristics of respondents.

Variable		Upper Keys	Middle Keys	Lower Keys	All strata
Age of respondent in years	Mean	42.9	58.9	52.9	52.1
	Standard error	2.5	2.7	1.7	2.5
	Median	39.0	63.5	53.0	52.0
Years residence in current county	Mean	13.8	17.4	18.2	17.1
	Standard error	2.0	1.9	1.3	1.2
	Median	13.0	14.5	15.0	15.0
Number of persons in household	Mean	2.7	2.1	2.3	2.3
	Standard error	0.3	0.2	0.1	0.1
	Median	2.0	2.0	2.0	2.0
Percent household income from reef fish	Mean	51.6	24.8	35.9	36.9
	Standard error	6.8	5.5	4.6	3.6
	Median	50.0	17.5	20.0	25.0
Percent household income from other fishing	Mean	18.6	30.1	14.2	18.5
	Standard error	6.2	7.8	3.3	3.0
	Median	0.0	10.0	0.0	1.0
Percent household income from other sources	Mean	29.8	45.1	49.9	44.6
	Standard error	6.8	8.3	5.4	4.3
	Median	19.0	45.0	70.0	50.0
Years experience as commercial fisherman	Mean	15.4	18.6	16.1	16.5
	Standard error	2.5	3.2	1.4	1.4
	Median	13.0	14.0	14.0	14.0
Number of different gears ever used	Mean	3.8	3.9	3.7	3.7
	Standard error	0.5	0.6	0.4	0.3
	Median	3.0	3.0	3.0	3.0

Keys. As a group, respondents were well-educated, with 82 of them having completed high school or having had additional education after high school (Table 3). Respondents reported having lived an average of 17 years in Monroe County (Table 2).

Household size ranged from 1 to 6 persons, including the respondent, with an overall average of 2.3 persons (Table 2). Someone other than the respondent was also employed in approximately 2 out of 5 households, although this ratio differed among areas (Table 4). More than 50% of the respondents in the Upper Keys reported that someone else in the household was employed, while less than 50% of the respondents in the Middle and Lower Keys reported other household members who were employed. Only 1 out of 6 households included a family member who was employed in commercial fishing with the respondent (Table 5).

Household incomes ranged from less than $10,000 to more than $150,000, with approximately two-thirds (52 of 78) of those who responded to the question citing household incomes of less than $40,000 (Table 6). For all areas combined, respondents averaged approximately 37% of household income from commercial fishing for reef fishes, 18% from other types of commer-

Table 3

Amount of formal education by respondents.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
None	0	0	1	1
Grades 1-8	1	5	3	9
Some high school	2	1	7	10
High school graduate	8	6	23	37
Vocational/technical	0	2	3	5
Some college	4	5	12	21
College graduate	6	5	8	19
Total	21	24	57	102
Estimated total numbers among active boats				
None	0	0	4	4
Grades 1-8	4	19	13	36
Some high school	9	4	30	43
High school graduate	35	23	100	158
Vocational/technical	0	8	13	21
Some college	17	19	53	89
College graduate	26	19	35	80
Total	91	92	248	431

Table 4

Number of households in which someone other than respondent was employed.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Yes	12	7	23	42
No	9	17	34	60
Total	21	24	57	102
Estimated total numbers among active boats				
Yes	52	27	100	179
No	39	65	148	252
Total	91	92	248	431

Table 5

Number of households with members who were employed with respondent.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Yes	4	2	11	17
No	17	22	46	85
Total	21	24	57	102
Estimated total numbers among active boats				
Yes	17	8	48	73
No	74	84	200	358
Total	91	92	248	431

cial fishing, and 45% from all other sources including incomes earned in non-fishing jobs held by the respondent and other household members, pensions, investments, and so forth (Table 2).

When compared to respondents in other areas, respondents in the Upper Keys reported the greatest reliance on commercial fishing for reef fishes as a source of household income and the least reliance on sources other than commercial fishing (Table 2). On average, commercial fishing for reef fishes accounted for 52% of household income in the Upper Keys. Four respondents (19%) reported that 100% of their household income came from commercial fishing for reef fishes, whereas 11 respondents (52%) reported no household income from other types of commercial fishing, and 7 respondents (33%) reported no non-fishing sources of household income.

In contrast, respondents in the Middle Keys reported the least reliance on commercial fishing for reef fishes (Table 2). One-half of the respondents reported

Table 6

Household income of respondents for 1993.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Did not know	0	3	8	11
Declined to answer	3	8	2	13
Under $10,000	2	1	5	8
$10,000–19,999	5	1	10	16
$20,000–29,999	2	2	5	9
$30,000–39,999	4	6	9	19
$40,000–49,999	0	1	5	6
$50,000–59,999	0	1	2	3
$60,000–69,999	0	0	7	7
$70,000–79,999	0	0	2	2
$80,000–89,999	1	0	1	2
$90,000–99,999	2	0	0	2
$100,000–124,999	1	0	0	1
$125,000–149,999	0	0	0	0
$150,000 or more	1	1	1	3
Total	21	24	57	102
Estimated total numbers among active boats				
Did not know	0	11	35	46
Declined to answer	13	31	9	53
Under $10,000	9	4	22	35
$10,000–19,999	22	4	43	69
$20,000–29,999	9	7	22	38
$30,000–39,999	17	23	39	79
$40,000–49,999	0	4	22	26
$50,000–59,999	0	4	9	13
$60,000–69,999	0	0	30	30
$70,000–79,999	0	0	9	9
$80,000–89,999	4	0	4	8
$90,000–99,999	9	0	0	9
$100,000–124,999	4	0	0	4
$125,000–149,999	0	0	0	0
$150,000 or more	4	4	4	12
Total	91	92	248	431

less than 17.5% of household income from commercial fishing for reef fishes, and only four respondents (18%) reported that more than 50% of their household income came from commercial fishing for reef fishes. Similarly, one-half of the respondents reported less than 10% of household income came from other types of commercial fishing. On average, non-fishing sources of income accounted for 45% of household income in the Middle Keys.

Respondents in the Lower Keys reported the greatest reliance on non-fishing sources of household income, with one-half of the respondents having received 70% or more of their household income from sources other than commercial fishing (Table 2). Fifty percent of re-

Table 7

Position of respondent on sampled boat.

Position	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Owner/captain	20	21	55	96
Owner/not captain	1	2	2	5
Captain/not owner	0	1	0	1
Total	21	24	57	102
Estimated total numbers among active boats				
Owner/captain	87	80	239	406
Owner/not captain	4	8	9	21
Captain/not owner	0	4	0	4
Total	91	92	248	431

spondents reported less than 20% of their household income came from commercial fishing for reef fishes, and 54% reported no income from commercial fishing for other species.

Nearly all respondents (96 of 102) were owners and operators of the boats selected for the survey (Table 7). Five of the remaining respondents were owners who did not captain their boats and the sixth was a hired captain. Respondents reported between 2 and 66 years experience as commercial fishermen, with an overall average of 16.5 years (Table 2). The average number of years experience was about the same in all three areas of the Keys.

Respondents usually reported experience with several kinds of fishing gear (Table 2). All but five respondents reported experience with rods and reels (Table 8). In addition, respondents in all areas frequently cited experience with bandit reels, trolling lines, handlines, and spiny lobster and/or stone crab traps. Respondents in the Upper and Lower Keys cited experience with spear fishing, usually without powerheads. Twenty-two respondents reported having ever used just one gear, usually rods and reels.

Approximately 25% of the respondents reported some form of employment in addition to their commercial fishing activities (Table 9). The proportion of respondents who reported other employment was greatest in the Upper Keys (8 of 21=38%), least in the Middle Keys (4 of 24=17%), and about average in the Lower Keys (13 of 57=23%). Approximately 24% of respondents with other employment (6 out of 25) cited some type of commercial chartering activity, including fishing charters and guide services (Table 10). Other employment exhibited a seasonal component in the Lower Keys where employment was highest between April and September, but was not seasonal in the Upper or Middle Keys (Table 11).

Characteristics of sampled boats

Sampled boats were primarily of fiberglass construction (Table 12) and ranged in length from 18 to 65 feet, with an overall average of 28.9 feet (Table 13). The 20–24 ft length class with 21 boats, the 25–29 ft length class with 38 boats, and the 30–34 ft length class with 28 boats were the most frequently occurring. Only 3 out of 102 sampled boats were smaller than 20 feet and 2 were longer than 45 feet. Boats did not differ significantly in average length by area within the Keys. The average age of boat was 14 years (Table 13).

The boats' engines ranged from 80 to 670 horsepower (hp), with an overall average of 247 hp (Table 13). Most sampled boats (83 out of 101) were reported to have engines with 100 to 399 hp. Fuel capacity ranged from 12 to 1600 gallons, with two-thirds of the boats having a capacity of less than 250 gallons and all but seven boats having a capacity of less than 500 gallons. Fifty percent of sampled boats in all areas combined had a fuel capacity of less than 135 gallons (Table 13). A majority of boats in the Upper and Middle Keys used diesel-powered engines, whereas a majority of boats in the Lower Keys used gasoline-powered engines (Table 14).

Boats were equipped with holding boxes or insulated coolers for ice and fish. These ranged in capacity from 80 to 10,000 pounds, with an overall average of 1,355 pounds (Table 13). The average capacity of fish boxes did not differ significantly by area for boats in the Keys. Fifty percent of the sampled boats in all areas combined had a holding capacity of less than 600 pounds.

One-third of the sampled boats were documented with the U.S. Coast Guard. Nearly all were equipped with LORAN-C, VHF radios, and some form of depth recorder or fish finder (Table 15). Twenty-three of 102 sampled boats had GPS in 1993, and it is expected that many of the remaining boats have purchased GPS units since then.

Most (88) sampled boats were purchased by their current owners since 1980 for an original investment ranging between $2,000 and $400,000, with an overall average investment of $41,647 per boat and a median investment of $33,000 per boat (Table 16). The average investment for boats in the Upper Keys was numerically greater than the average investments for boats in the Middle and Lower Keys, but was not statistically different after accounting for variation of the responses. The estimated total investment for all 431 active boats in the sampled population was $17.9 million: $6.0 million for boats in the Upper Keys, $3.6 million for boats in the Middle Keys, and $8.3 million for boats in the Lower Keys (Table 16).

Respondents estimated that the value of their boats at the time of the survey ranged from $1,500 to $115,000. Boats in the Upper Keys averaged $32,733; boats in the

Table 8

Gears that respondents have ever used.

Gear type	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Rods and reels	21	22	54	97
Bandit reels	13	8	20	41
Trolling lines	8	13	19	40
Lobster/stone crab traps	9	8	20	37
Handlines	5	8	20	33
Spear fishing—no powerheads	5	2	15	22
Hand held electric reels	6	2	13	21
Other fish pots	3	8	9	20
Bottom longlines	4	6	7	17
Gill nets	0	6	8	14
Surface longlines	2	6	2	10
Spear fishing—powerheads	1	1	6	8
Other gears	1	1	5	7
Shrimp/fish trawls	1	0	4	5
Hand/trolling lines	0	1	4	5
Sea bass pots	0	0	3	3
Buoys	0	1	0	1
Number of respondents	21	24	57	102
Estimated total numbers among active boats				
Rods and reels	91	85	235	411
Bandit reels	56	31	87	174
Trolling lines	35	50	83	168
Lobster/stone crab traps	39	31	87	157
Handlines	22	31	87	140
Spear fishing—no powerheads	22	8	65	95
Hand held electric reels	26	8	56	90
Other fish pots	13	31	39	83
Bottom longlines	17	23	30	70
Gill nets	0	23	35	58
Surface longlines	9	23	9	41
Spear fishing—powerheads	4	4	26	34
Other gears	4	4	22	30
Shrimp/fish trawls	4	0	17	21
Hand/trolling lines	0	4	17	21
Sea bass pots	0	0	13	13
Buoys	0	4	0	4
Total number of boats	91	92	248	431

Middle Keys averaged $18,587; and boats in the Lower Keys averaged $21,807 (Table 16). Average resale values were not statistically different among areas after accounting for variation of the responses. The overall average resale value was $23,421 per boat, with a median value of $18,000 per boat.

The estimated total resale value for all boats in the sampled population was $10.1 million (Table 16). This is loosely interpreted as the estimated total value of capital currently invested in the commercial reef fish fishery in the Florida Keys, although some boats in the sampled population participated in other fisheries, and other boats with minimal participation in the reef fish fishery were excluded from the sampling universe. Boats were worth an estimated $3.0 million in the Upper Keys, $1.7 million in the Middle Keys, and $5.4 million in the Lower Keys (Table 16).

Resale value depends, in part, on the expected profitability of fishing. One measure of expected future profitability is profit during the current year. Average annual gross revenues and net incomes were highest for boats in the Upper Keys, lowest for boats in the Middle Keys, and about average for boats in the Lower Keys (Table 16). Revenues averaged $49,581 per boat per

Table 9

Number of respondents with employment other than commercial fishing.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Yes	8	4	13	25
No	13	20	44	77
Total	21	24	57	102
Estimated total numbers among active boats				
Yes	35	15	57	107
No	56	77	191	324
Total	91	92	248	431

Table 10

Number of respondents by type of employment other than commercial fishing.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Charter boat	2	0	2	4
Fishing guide	0	0	2	2
Private captain	1	0	0	1
Fishery research	0	0	1	1
Tropical fish collector	1	0	0	1
Aquaculture	0	0	1	1
School teacher	1	0	0	1
Guidance counselor	0	0	1	1
Mechanic	0	1	0	1
Appliance service	1	0	0	1
Submarine cable repair	0	0	1	1
Bartender	0	1	1	2
Sales	1	0	1	2
Meat cutter	0	0	1	1
Barber	0	1	0	1
Antique dealing	0	0	1	1
Security guard	0	1	0	1
Paramedic	1	0	0	1
Other	0	0	1	1
Total	8	4	13	25

year in the Upper Keys, $13,714 in the Middle Keys, and $28,027 in the Lower Keys, but most boats earned less than the average. Fifty percent of the sampled boats earned less than $35,395 in the Upper Keys, less than $10,956 in the Middle Keys, and less than $13,000 in the Lower Keys (Table 16). Median gross revenue was $15,000 per boat for all areas combined.

Net incomes were small, with an overall average of $6,879 per boat per year. Approximately 75% of responses (67 out of 89) reported annual net incomes of less than $10,000, including 18 responses of $0 or less. Fifty percent of the sampled boats earned less than $7,981 in the Upper Keys, less than $800 in the Middle Keys, and less than $2,500 in the Lower Keys (Table 16). Thirteen people declined to respond to questions about net income.

Estimated total revenues for 1993 when aggregated over all boats in the sampled population were approximately $12.7 million, with aggregate net incomes of $3.0 million (Table 16). Boats earned an estimated $4.5 million in revenues and $1.0 million in net income in the Upper Keys, $6.9 million in revenues and $1.65 million in net income in the Lower Keys, and $1.3 mil-

Table 11

Seasonal employment of respondents in other jobs.

Month	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
January	8	4	9	21
February	8	4	9	21
March	8	4	8	20
April	8	4	12	24
May	8	3	13	24
June	8	3	12	23
July	7	3	10	20
August	7	3	10	20
September	8	3	11	22
October	8	3	8	19
November	8	3	7	18
December	8	4	7	19
Total	8	4	13	25

Table 12

Primary material used in construction of hull for commercial reef fish boats.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Fiberglass	20	21	56	97
Wood	1	2	1	4
Wood/fiberglass	0	1	0	1
Total	21	24	57	102
Estimated total numbers among active boats				
Fiberglass	87	80	244	411
Wood	4	8	4	16
Wood/fiberglass	0	4	0	4
Total	91	92	248	431

Table 13

Estimated means, medians, and standard errors of means for selected physical characteristics of commercial reef fish boats.

Variable		Upper Keys	Middle Keys	Lower Keys	All strata
Total length of boat (feet)	Mean	30.4	29.0	28.3	28.9
	Standard error	2.2	0.9	0.9	1.4
	Median	29.0	28.5	26.0	27.0
Age of boat (years)	Mean	13.6	17.2	12.8	13.9
	Standard error	1.5	1.8	0.9	0.9
	Median	14.0	16.0	12.0	13.0
Engine horsepower (hp)	Mean	296.9	237.8	232.7	247.3
	Standard error	32.5	22.7	14.6	15.5
	Median	245.0	222.5	212.5	220.0
Fuel capacity (gallons)	Mean	182.2	213.9	223.0	212.5
	Standard error	29.9	40.4	35.0	24.5
	Median	150.0	144.5	125.0	135.0
Capacity of fish boxes (pounds)	Mean	1,364.3	1,433.0	1,323.4	1,355.5
	Standard error	315.9	329.2	256.9	185.3
	Median	600.0	700.0	550.0	600.0

Table 14

Type of fuel used on commercial reef fish boats.

Response	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Diesel	12	16	27	55
Gasoline	9	8	30	47
Total	21	24	57	102
Estimated total numbers of active boats				
Diesel	52	61	118	231
Gasoline	39	31	130	200
Total	91	92	248	431

lion in revenues and $0.3 million in net income in the Middle Keys.

Fishing activities

Nearly all boats fished for reef fishes in the Keys (Table 17), which accounted for an overall average of 60% of each boat's annual revenues (Table 18). One-half of the boats reported that reef fishes in the Keys accounted for more than 70% of their annual revenues. More than two-thirds of them also fished for other species in the Keys (Table 17), which accounted for an overall average of 20% of annual revenues (Table 18). One-half of the sampled boats reported that other species in the Keys accounted for less than 10% of annual revenues.

Approximately one-third of the boats in the Middle and Lower Keys also fished for reef fishes and other species in Gulf waters outside of the Keys (Table 17), with a combined average contribution for reef fishes and other species of 14–15% of annual revenues per boat (Table 18). Few boats fished in Atlantic waters outside of the Keys (Table 17), with a correspondingly small average contribution to annual revenues (Table 18). Only seven boats in the sample, including two from the Upper Keys, one from the Middle Keys, and four from the Lower Keys, reported revenues from charter fishing (Table 17). Nevertheless, these few boats earned relatively high fractions of their annual revenues from chartering, which resulted in unexpectedly high overall average contributions to annual revenues, especially in the Upper Keys (Table 18).

Given a list of 31 important reef and non-reef species, respondents ranked the species caught during 1993 in terms of their importance to annual revenues. To derive estimates of the total number of boats that fished for each species, survey responses were expanded to the entire population of eligible (active) boats within each stratum and then added over all strata. The estimated total numbers of boats are not additive across species because boats that harvested more than one species would be counted more than once.

Yellowtail snapper (*Ocyurus chrysurus*) clearly was the most important species in all three areas of the Keys. Eighteen of 21 respondents (86%) in the Upper Keys fished for yellowtail snapper, with 14 of them citing it as their most important species in terms of annual revenues. In the Middle Keys, 20 of 24 respondents (83%)

Table 15

Number of boats with selected kinds of electronic equipment on board.

Electronics on board	Upper Keys	Middle Keys	Lower Keys	Total	Electronics on board	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum					Estimated total numbers of active boats				
LORAN-C	18	23	54	95	LORAN-C	78	88	235	401
GPS	10	3	10	23	GPS	43	12	43	98
EPIRB	7	7	15	29	EPIRB	30	27	65	122
Radar	3	0	6	9	Radar	13	0	26	39
Color scope	14	9	22	45	Color scope	61	35	96	192
LCD fish finder	6	8	26	40	LCD fish finder	26	31	113	170
Paper recorder	7	11	20	38	Paper recorder	30	42	87	159
Plotter	3	0	8	11	Plotter	13	0	35	48
VHF radio	19	24	56	99	VHF radio	82	92	243	417
Cellular phone	6	2	8	16	Cellular phone	26	8	35	69
Single sideband radio	1	1	1	3	Single sideband radio	4	4	4	12
Computer	1	0	2	3	Computer	4	0	9	13
Other	3	4	5	12	Other	13	15	22	50
Sampled boats	21	24	57	102	Estimated total boats	91	92	248	431

Table 16

Estimates of financial characteristics of reef fish boats.

Variable		Upper Keys	Middle Keys	Lower Keys	All strata
Estimated means, medians, and standard errors of means per boat					
Investment in boat and gear ($)	Mean	65,785	39,423	33,625	41,647
	Standard error	20,461	8,046	2,735	5,172
	Median	33,500	33,000	32,000	33,000
Resale value of existing boat ($)	Mean	32,733	18,587	21,807	23,421
	Standard error	6,657	2,320	2,532	2,278
	Median	20,000	16,000	19,000	18,000
Gross revenue in 1993 ($)	Mean	49,581	13,714	28,027	29,505
	Standard error	9,694	2,648	4,777	3,662
	Median	35,395	10,956	13,000	15,000
Net income before taxes ($)	Mean	11,129	3,301	6,653	6,879
	Standard error	2,761	1,859	3,411	2,102
	Median	7,981	800	2,500	3,000
Estimated totals and standard errors of totals for all eligible (active) boats in the sampled population (thousands of dollars)					
Investment in boat and gear ($)	Total	5,974	3,637	8,327	17,939
	Standard error	1,899	825	823	2,228
Resale value of existing boat ($)	Total	2,973	1,715	5,401	10,088
	Standard error	635	273	697	981
Gross revenue in 1993 ($)	Total	4,503	1,265	6,941	12,709
	Standard error	928	275	1,246	1,577
Net income before taxes ($)	Total	1,011	305	1,648	2,963
	Standard error	259	174	850	905

Table 17

Kinds of fishing activities for commercial reef fish boats.

Fishing activities	Upper Keys	Middle Keys	Lower Keys	Total
Numbers of respondents, by stratum				
Reef fish in Keys	21	23	55	99
Other species in Keys	16	18	37	71
Reef fish in Gulf	3	8	23	34
Other species in Gulf	4	5	14	23
Reef fish in Atlantic	2	4	5	11
Other species in Atlantic	1	3	4	8
Charter/head boat	2	1	4	7
Number of respondents	21	24	57	102
Estimated total numbers among active boats				
Reef fish in Keys	91	88	239	418
Other species in Keys	69	69	161	299
Reef fish in Gulf	13	31	100	144
Other species in Gulf	17	19	61	97
Reef fish in Atlantic	9	15	22	46
Other species in Atlantic	4	12	17	33
Charter/head boat	9	4	17	30
Total number of boats	91	92	248	431

fished for yellowtail snapper, with 16 of them citing it as their most important species. Similarly, 47 of 57 respondents (82%) in the Lower Keys fished for yellowtail snapper, with 38 of them citing it as their most important species. Overall, it was estimated that 359 out of 431 active boats (83%) in the sampled population fished for yellowtail snapper, and that 287 of them (67%) ranked yellowtail snapper as their most important species in terms of annual revenues (Table 19).

Yellowtail snapper was an important source of revenue throughout the year. Fifty percent or more of the sampled boats fished for yellowtail snapper each month between December and June in the Upper Keys, between December and April in the Middle Keys, and between October and June in the Lower Keys. Yellowtail snapper was the most frequently landed species even in the remaining months. The estimated total number of active boats that landed yellowtail snapper as an important source of revenue ranged from 141 in August to 278 in March (Table 20). Other boats harvested yellowtail snapper incidentally while fishing primarily for other species (Table 21).

Boats fished for other species too, but none were cited as frequently or ranked as highly as yellowtail snap-

Table 18

Estimated means, medians, and standard errors of means for the percentages, by source, of annual revenues per boat. (Note: This table shows percentages of annual boat revenues from each type of fishing enterprise, and should not be confused with information presented in Table 2 which shows percentages of household income from different sources.)

Variable		Upper Keys	Middle Keys	Lower Keys	All strata
Percent revenues from reef fish in Keys	Mean	60.2	58.0	61.4	60.4
	Standard error	7.2	7.7	4.3	4.2
	Median	70.0	70.0	70.0	70.0
Percent revenues from other species in Keys	Mean	23.7	21.7	18.9	20.5
	Standard error	5.2	5.9	2.9	2.5
	Median	15.0	10.0	10.0	10.0
Percent revenues from reef fish in Gulf	Mean	3.6	10.4	9.7	8.6
	Standard error	2.9	4.6	2.5	1.9
	Median	0.0	0.0	0.0	0.0
Percent revenues from other species in Gulf	Mean	2.4	4.1	4.4	3.9
	Standard error	1.5	2.8	1.2	1.0
	Median	0.0	0.0	0.0	0.0
Percent revenues from reef fish in Atlantic	Mean	1.3	3.0	2.4	2.3
	Standard error	1.0	1.6	1.8	1.1
	Median	0.0	0.0	0.0	0.0
Percent revenues from other species in Atlantic	Mean	0.4	1.7	0.8	0.9
	Standard error	0.4	1.2	0.5	0.4
	Median	0.0	0.0	0.0	0.0
Percent revenues from charter fishing	Mean	8.3	0.9	2.5	3.4
	Standard error	5.7	0.9	1.5	1.5
	Median	0.0	0.0	0.0	0.0

per as an important source of annual revenues. Spiny lobster (*Panulirus argus*) was the species cited second most frequently as being most important in terms of annual revenues (Table 19). Lobsters were landed between August and March with the estimated number of boats declining each month (Table 20). It was estimated that about 20% of the active population of boats fished for spiny lobster during the early months of the lobster season.

Black grouper (*Mycteroperca bonaci*), mutton snapper (*Lutjanus analis*), gray snapper (*L. griseus*), and king mackerel (*Scomberomorus cavalla*) were commonly mentioned as the second, third, fourth, or lower ranked species (Table 19), principally in the Upper and Lower Keys. Black grouper were harvested year-round both as an important source of revenue (Table 20) and as an incidentally caught species (Table 21), with the greatest levels of directed effort occurring between November and April. Gray snapper also were harvested throughout the year (Tables 20 and 21), with the greatest directed effort occurring between May and August in the Lower Keys, between June and August in the Upper Keys, and between February and July in the Middle Keys. Mutton snapper were harvested year-round, but primarily between October and July and primarily as an incidentally caught species (Tables 20 and 21). King mackerel were caught seasonally during the late fall and spring, with the greatest number of boats fishing during December and January (Tables 20 and 21).

Less frequently ranked species included stone crab (*Menippe mercenaria*), red grouper (*Epinephelus morio*), and greater amberjack (*Seriola dumerili*), among others (Table 19). Stone crab were harvested primarily between October and March (Table 20). Red grouper was ranked no higher than the third leading producer of revenues (Table 19), primarily in the Lower Keys, whereas other

Table 19

Number of boats that ranked each main species in terms of total revenues for 1993.

	Rank														
Primary species	1	2	3	4	5	6	7	8	9	10	11	12	13	14+	Total
Estimated total number of active boats in sampled population, all areas combined															
Black grouper	9	78	34	16	17	4	—	4	4	4	—	—	—	—	170
Gag	—	—	4	9	4	9	—	8	—	—	—	4	—	—	38
Red grouper	—	—	17	17	17	8	8	9	—	4	4	—	—	—	84
Scamp	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4
Snowy grouper	9	4	9	9	4	4	4	—	—	—	—	—	—	—	43
Yellowedge grouper	4	—	—	—	—	—	4	—	—	—	—	—	—	4	12
Warsaw	4	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Other groupers	—	13	—	9	—	4	—	—	—	—	—	—	—	—	26
Gray snapper	9	51	29	26	8	4	8	4	—	—	—	—	—	—	139
Mutton snapper	4	30	35	21	17	4	13	8	4	—	—	—	—	—	136
Red snapper	—	—	—	—	—	—	—	4	—	—	—	4	—	—	8
Vermilion snapper	—	—	—	—	4	—	—	—	—	—	—	—	—	4	8
Yellowtail snapper	287	30	21	8	4	9	—	—	—	—	—	—	—	—	359
Other snappers	13	8	8	4	—	—	—	—	—	—	—	—	—	4	37
Hogfish	—	—	13	8	—	—	—	—	4	—	—	—	—	4	29
Amberjacks	4	4	13	4	9	8	13	—	—	—	—	—	4	—	59
Porgies	—	—	—	—	—	—	—	—	—	—	—	—	4	—	4
Golden tilefish	—	—	4	4	—	—	—	—	—	—	—	—	—	4	12
Other tilefishes	8	13	9	—	4	9	—	—	4	—	4	—	—	—	51
Other reef fishes	8	—	—	—	—	—	—	—	—	4	—	—	—	—	12
King mackerel	—	29	47	34	9	17	4	9	4	—	4	—	4	—	161
Sharks	—	—	—	4	4	4	—	—	—	4	—	—	—	—	16
Spiny lobster	59	26	13	—	4	4	—	—	—	—	—	—	—	—	106
Stone crab	13	21	8	17	4	4	4	4	—	—	—	—	—	—	75
Tuna	—	4	4	4	4	—	—	—	—	—	—	—	—	4	20
Other non reef fishes	—	41	12	9	13	—	4	4	4	—	—	4	—	—	91
Total	431	352	280	203	126	92	62	54	24	16	12	12	12	28	

Table 20

Number of boats that fished each month, by main species, excluding boats for which this species was an incidental catch.

Primary species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Estimated total number of active boats in sampled population, all areas combined												
Black grouper	104	116	112	91	73	68	60	43	30	56	86	82
Gag	17	17	9	4	8	8	4	4	0	9	13	13
Red grouper	34	30	26	26	29	29	33	21	0	17	34	30
Snowy grouper	34	34	30	43	39	39	34	26	26	26	26	30
Yellowedge grouper	4	9	9	9	0	0	0	0	0	4	4	0
Warsaw	4	4	4	0	0	4	4	4	0	4	4	0
Other groupers	9	9	9	4	0	0	0	0	0	4	4	4
Unspecified groupers	9	13	16	16	12	12	8	8	4	4	9	13
Gray snapper	46	58	62	58	76	101	119	73	47	42	41	33
Mutton snapper	51	69	65	56	56	64	63	29	30	56	64	42
Red snapper	0	0	0	0	4	4	4	0	0	0	0	0
Vermilion snapper	0	0	0	0	4	4	4	0	0	0	0	0
Yellowtail snapper	259	275	278	263	217	225	166	141	149	193	242	253
Other snappers	8	8	4	4	8	8	8	8	8	4	4	4
Unspecified snappers	0	4	4	4	8	8	8	4	0	0	0	4
Hogfish	9	9	13	13	13	17	21	17	8	9	4	9
Amberjacks	17	17	22	17	34	21	0	0	4	4	4	9
Golden tilefish	4	4	0	4	4	9	0	0	0	4	4	4
Other tilefishes	26	26	26	39	34	30	22	17	17	26	26	21
Other reef fishes	4	4	4	4	0	0	0	0	0	4	8	8
King mackerel	116	56	56	21	13	4	0	0	9	17	43	98
Sharks	4	0	0	0	0	4	4	0	0	0	0	0
Spiny lobster	59	55	46	0	4	9	9	94	89	80	72	63
Stone crab	54	54	54	37	29	4	4	9	13	59	59	59
Tuna	9	9	9	4	4	0	4	4	4	4	4	13
Other non-reef fishes	29	25	21	24	50	45	33	37	21	8	12	28
Charter boat fishing	4	4	4	4	4	4	4	4	4	9	9	9

boats caught them incidentally while fishing for other species (Table 21). Greater amberjack were landed during the spring as an important source of revenue (Table 20), primarily in the Upper Keys. Dolphin (*Coryphaena hippurus*) was the most frequently harvested species within the "other non-reef fish" category.

Financial performance on different kinds of fishing trips

Some boats fished in one kind of activity year-round whereas others rotated among several kinds of fishing trips according to seasonal availability of fish, seasonal variation in prices, fishery regulations, and so forth. One objective of this survey was to estimate average net operating revenues per boat per trip and per boat per year earned on the most important kinds of fishing trips taken by reef fish boats. For this purpose, respondents completed supplemental questionnaires about fishing effort, catches, revenues, and routine operating costs for their two most important kinds of fishing trips for reef fish. Boats that engaged in only one kind of fishing for reef fish were asked about it and also about trips for their highest ranked non-reef fish species, if any. Seventy-seven respondents completed supplemental questionnaires about two kinds of fishing trips and 25 others completed questionnaires about one kind of trip, for a total of 179 supplemental questionnaires.

Each kind of fishing trip was defined by noting the species with the largest contribution to the total revenues of the trip. A majority of respondents cited yellowtail snapper as one of their most important sources of revenues, and other kinds of trips were described less frequently (Table 22). Small sample sizes necessitated that several kinds of trips be combined to estimate average catches, revenues, routine trip costs, and net operating revenues per boat per trip and per boat per year. Trips for yellowtail snapper, gray snapper, and greater amberjack were examined separately, while trips for mutton snapper, black, red, and unspecified groupers

Table 21

Number of boats that fished each month, by incidental species.

Incidental species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Estimated total number of active boats in sampled population, all areas combined												
Black grouper	77	97	92	92	92	101	75	63	58	55	72	76
Gag	—	—	8	8	8	8	8	9	4	4	4	4
Red grouper	38	51	55	51	39	51	42	34	34	34	47	42
Snowy grouper	17	13	17	13	26	30	13	13	9	17	17	8
Warsaw	4	4	4	4	8	8	4	—	—	—	—	—
Other groupers	—	—	—	—	4	4	4	4	—	—	—	—
Unspecified groupers	82	95	99	73	56	39	35	35	43	65	82	69
Gray snapper	80	80	85	80	76	67	63	67	50	63	71	67
Mutton snapper	104	112	133	132	119	124	103	77	64	94	107	103
Yellowtail snapper	42	38	34	39	34	41	46	26	4	25	33	29
Other snappers	4	9	4	9	4	4	4	4	4	4	9	4
Unspecified snappers	22	26	26	22	17	17	17	13	13	13	22	22
Hogfish	9	9	13	9	17	26	22	17	13	13	9	4
Amberjacks	35	39	39	35	30	35	39	43	35	35	35	30
Porgies	30	34	39	22	22	30	17	9	13	17	21	13
Other tilefishes	4	4	4	4	9	9	9	9	9	4	4	4
Unspecified tilefishes	9	9	9	4	9	13	4	4	—	4	4	—
Triggerfishes	9	4	9	9	4	9	9	4	4	4	4	4
Other reef fishes	41	54	49	46	42	63	43	39	21	26	45	25
King mackerel	56	60	55	55	42	42	21	21	26	34	52	52
Sharks	4	13	9	13	9	9	4	—	—	4	4	4
Spiny lobster	4	4	4	4	4	4	4	4	—	4	—	4
Tuna	—	—	—	—	4	4	4	4	4	—	—	—
Other non-reef fishes	107	116	112	91	108	73	52	52	39	65	86	98

Table 22

Number of trip interviews by main species and area.

Main species	Upper Keys	Middle Keys	Lower Keys	Total	Main species	Upper Keys	Middle Keys	Lower Keys	Total
Black grouper	6	0	10	16	Amberjacks	4	1	3	8
Red grouper	1	0	0	1	Hogfish	0	1	1	2
Snowy grouper	2	0	2	4	Tilefishes	0	1	3	4
Warsaw grouper	1	0	0	1	Other reef fishes	0	2	0	2
Yellowedge grouper	0	0	1	1	Dolphin	1	2	3	6
Unspecified groupers	0	1	1	2	King mackerel	0	3	5	8
Gray (mangrove) snapper	3	7	10	20	Spiny lobster	1	2	5	8
Mutton snapper	4	1	2	7	Stone crab	0	0	1	1
Silk snapper	1	0	0	1	Tunas	0	0	2	2
Yellowtail snapper	16	20	47	83	Other species	0	0	1	1
Unspecified snappers	0	0	1	1	Total	40	41	98	179

were combined because these species frequently were landed together. Also, trips for deeper water species such as snowy grouper (*E. niveatus*), yellowedge grouper (*E. flavolimbatus*), warsaw (*E. nigritus*), blueline tilefish (*Caulolatilus microps*), golden tilefish (*Lopholatilus chamaeleonticeps*), and silk snapper (*Lutjanus vivanus*) were combined. Relatively few observations were obtained for non-reef fish species because respondents

Table 23

Average net operating revenues per trip, per day fished, and per person per day fished for different kinds of fishing trips by commercial reef fish boats in the Florida Keys.

	Kind of trip				
Variable	Yellowtail snapper	Black grouper/ mutton snapper	Gray snapper	Deepwater species	Greater amberjack
Net operating revenues per trip	$337	$323	$195	$162	$563
Days fished per trip	1.6	1.4	1.3	1.0	1.0
Net operating revenues per day fished	$190	$225	$149	$173	$563
Persons aboard per trip	1.8	1.7	2.3	1.6	2.5
Net operating revenues per person per day	$110	$134	$ 76	$107	$206
Trips per boat per year	52	33	25	32	25
Net operating revenues per boat per year	$9,901	$9,062	$4,469	$5,049	$14,912
Estimated number of boats per year[1]	350	112	83	46	33
Net operating revenues per year	$3,468,216	$1,012,542	$372,448	$232,251	$498,145

Variable	Spiny lobster	King mackerel	Dolphin
Net operating revenues per trip	$1,838	$106	$88
Days fished per trip	2.6	1.0	1.0
Net operating revenues per day fished	$627	$106	$88
Persons aboard per trip	2.3	1.7	2.0
Net operating revenues per person per day	$363	$68	$45
Trips per boat per year	40	18	18
Net operating revenues per boat per year	$47,552	$2,238	$2,236

[1] The estimated number of boats per year differs in definition, and hence in magnitude, from that presented in Table 19. This table presents estimates of the total number of boats that participated in particular kinds of trips as defined by the species with the greatest contribution to total revenues of the trip. Table 19 presents estimates of the number of boats for which each species was an important source of annual revenue regardless of the kind of trip on which it was caught.

were asked to complete supplemental questionnaires about the two most important types of trips for reef fishes even if non-reef fish alternatives made larger contributions to the annual revenues of the boat. Trips for spiny lobster, king mackerel, and dolphin were seasonal alternatives to fishing for reef fishes.

The economic performance of each kind of fishing activity was evaluated from the perspective of boat owner, captain, and crew combined, rather than from the perspective of the boat owner only, because the share system of payments in commercial fisheries distributes the economic surplus from the fishing operation among boat owner, captain, and crew. Although share payments to captain and crew may represent labor costs to the boat owner, they may exceed actual, but unknown, opportunity costs of labor, which is the appropriate definition of cost from the perspective of society as a whole. Opportunity cost could be assumed equal to the average wage paid in the major local industry, but this wage varies geographically and it may be difficult to accurately determine the circumstances relevant to each sampled boat. Therefore, economic performance is evaluated in terms of total share payments to owner, captain, and crew without imposing assumptions about opportunity cost that may or may not be relevant. Estimates of share payments for owner, captain, and crew separately are tabulated for readers who desire more detailed information.

Three measures of overall economic performance were calculated for each kind of fishing trip: net operating revenues per trip, per day fished, and per person per day fished (Table 23). Net operating revenues per trip were defined as the combined share payments to boat owner, captain, and crew after deducting routine trip expenses, which included fuel, bait, ice, lost gear, food, packing charges if any, and other miscellaneous supplies. Net operating revenues per day fished were calculated as net revenue per trip divided by days fished per trip to correct for observed variations in net revenue due to differences in the duration of fishing trips among boats and between fishing activities. Net revenues per person per day fished were calculated as net revenue per day fished divided by the number of persons aboard to correct for observed variations in net

Table 24

Estimated means and standard errors per boat per trip in the Florida Keys when yellowtail snapper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of yellowtail snapper	82	1,500	182	33	116	249
Total pounds, all species	82	2,064	246	45	156	336
Percent pounds by yellowtail snapper	82	100	77	2	73	80
Revenue from yellowtail snapper	82	3,400	413	80	254	572
Total revenue, all species	83	4,852	510	98	315	704
Percent revenue by yellowtail snapper	82	100	81	1	78	83
Routine trip costs	83	1,808	173	33	109	238
Cost as percent of total revenue	83	136	43	2	38	48
Net to boat, captain and crew	83	3,044	337	69	200	473
Payment to boat owner	82	2,216	103	33	37	170
Payment to captain	83	1,221	141	22	97	184
Payment to crew	83	1,220	94	25	44	143
Days fished	83	10	1.6	0.2	1.2	1.9
Number of persons aboard	83	4	1.8	0.1	1.7	2.0
Pounds (all species) per day fished	82	1,580	137	21	95	179
Net revenue per day fished per trip	83	2,441	190	33	123	256
Net revenue per person per day	83	1,221	110	17	76	145

revenue due to differences in crew size.[13] Net revenue per person per day fished reflects the overall fishing operation's economic performance rather than an accounting of actual wages earned by individual crew members.

Share payments should not be interpreted as profit, especially when examining averages per boat per year and the estimated totals for all boats that participated in each kind of fishing. Each kind of fishing represented one of several kinds of fishing trips on which boats and fishermen may have participated during the year. Hence, estimates of net operating revenues for each kind of fishing exclude the contributions of other fishing activities to the boat's overall net income. Also, boat owners incurred overhead expenses, other fixed costs, and other variable costs that were not routinely encountered per trip and which were not accounted for in these calculations. Likewise, overhead expenses incurred by crew members as independent contractors to boat owners were not accounted for in these calculations. Estimates of net income (before taxes) per boat per year for all fishing activities combined and for the fishery as a whole were presented in Table 16.

[13] Net revenues per day fished and per person per day fished were calculated for each boat, and the resulting individual observations were used to estimate averages and standard errors per boat for each kind of fishing.

A secondary objective was to estimate total catches, revenues, trip costs, and net operating revenues for all boats engaged in each kind of fishing trip. Estimates of fishery-wide totals in Table 23 were determined as the average per boat per year multiplied by the estimated total number of active boats that participated in each kind of fishing. However, the number of boats that participated in the less important reef fishing activities and the non-reef fish alternatives likely would be underestimated in the sample compared to the actual fishery because of the need to limit each interview to a maximum of two supplemental questionnaires if the respondent participated in more than two kinds of trips. Hence, the possibility for errors in estimating fishery-wide totals is greater than when estimating averages per boat per trip or per boat per year. In fact, estimates of fishery-wide totals were not made for the non-reef fish alternatives because respondents specifically were not asked about them if they had at least two kinds of trips for reef fishes.

Yellowtail snapper (Tables 24–26) was the most commonly sought species by commercial reef fish boats in the Florida Keys. In all, 350 boats were estimated to have made trips with yellowtail snapper as their primary species (Table 26). Collectively, they were estimated to have made 18,215 trips, fished for 20,445 days, and caught over 2.4 million pounds of fish worth about $5.2 million. Yellowtail snapper trips returned an estimated

Table 25

Estimated means and standard errors per boat per year in the Florida Keys when yellowtail snapper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of yellowtail snapper	82	26,250	5,213	627	3,961	6,466
Total pounds, all species	82	53,550	6,986	945	5,097	8,875
Percent pounds by yellowtail snapper	82	100	77	2	73	80
Revenue from yellowtail snapper	82	66,528	11,815	1,504	8,806	14,823
Total revenue, all species	83	99,015	14,716	1,960	10,799	18,633
Percent revenue by yellowtail snapper	82	100	81	1	78	83
Routine trip costs	83	22,050	4,815	471	3,876	5,754
Cost as percent of total revenue	83	136	43	2	38	48
Net to boat, captain and crew	83	76,965	9,901	1,551	6,799	13,004
Payment to boat owner	82	25,620	2,336	561	1,215	3,458
Payment to captain	83	33,360	5,363	723	3,919	6,808
Payment to crew	83	25,620	2,232	549	1,132	3,333
Number of trips	83	215	52	5	42	62
Days fished	83	215	58	5	49	68

Table 26

Estimated totals for all boats in sampled portion of the reef fish fishery when yellowtail snapper made the greatest contribution to trip revenue.

Variable	Sample size	Average per boat per year	Estimated number of boats	Estimated total for all boats	Std. error of total	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of yellowtail snapper	82	5,213	350	1,822,091	248,204	1,326,468	2,317,714
Total pounds, all species	82	6,986	350	2,441,672	365,325	1,711,695	3,171,649
Revenue from yellowtail snapper	82	11,815	350	4,129,274	587,986	2,953,381	5,305,168
Total revenue, all species	83	14,716	350	5,154,851	760,223	3,635,439	6,674,263
Routine trip costs	83	4,815	350	1,686,635	196,619	1,294,703	2,078,566
Net to boat, captain, and crew	83	9,901	350	3,468,216	586,121	2,295,885	4,640,547
Payment to boat owner	82	2,336	350	816,547	202,890	411,002	1,222,092
Payment to captain	83	5,363	350	1,878,650	279,912	1,319,570	2,437,730
Payment to crew	83	2,232	350	781,959	198,521	383,756	1,180,162
Number of trips	83	52	350	18,215	2,053	14,114	22,315
Days fished	83	58	350	20,445	2,103	16,245	24,645

$3.5 million to boat owners, captains, and crew members after payment of routine trip costs.

The popularity of yellowtail snapper trips was attributable to the species' ubiquitousness rather than its profitability. Trips were taken year-round and in all three areas of the Keys. Boats averaged 246 pounds worth $510 per trip, of which yellowtail snapper represented about 77% of catch and 81% of revenues (Table 24). Boats paid an average of $173 in routine trip costs and earned an average of $337 per trip to be shared by boat owner, captain, and crew. After accounting for variation among boats in days fished per trip and numbers of persons aboard, yellowtail snapper trips returned an average of $110 per person per day fished (Table 24) and $9,901 per boat per year (Table 25). Net operating revenues per trip for yellowtail snapper averaged more than on trips for gray snapper, deep water reef fishes, king mackerel, or dolphin; they were about the same as on trips for black grouper and mutton snapper, but were less than on trips for spiny lobster or greater amberjack (Table 23). Yellowtail snapper trips yielded smaller net returns than trips for black grouper and mutton snapper when evaluated per day fished and per person per day because yellowtail snapper trips were slightly longer and carried slightly more people aboard.

Table 27

Number of boats that fished each month for alternative target species and that otherwise fished for yellowtail snapper.

Target species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Estimated total number of active boats in all areas combined												
Black grouper	56	60	56	39	34	30	30	21	17	30	43	39
Gag	13	13	9	0	4	4	4	4	0	4	9	9
Red grouper	21	17	13	13	20	20	25	16	0	9	25	17
Snowy grouper	26	26	26	34	30	30	30	21	21	17	17	21
Yellowedge grouper	0	4	4	4	0	0	0	0	0	0	0	0
Warsaw	4	4	4	0	0	4	4	4	0	4	4	0
Other groupers	4	4	4	0	0	0	0	0	0	4	4	4
Unspecified groupers	0	0	4	4	4	4	0	0	0	0	0	0
Gray snapper	25	37	37	28	51	71	90	60	39	21	25	16
Mutton snapper	42	52	47	43	38	42	46	29	26	43	51	34
Red snapper	0	0	0	0	4	4	4	0	0	0	0	0
Vermilion snapper	0	0	0	0	4	4	4	0	0	0	0	0
Yellowtail snapper	259	275	278	263	217	225	166	141	149	193	242	253
Hogfish	0	0	0	0	0	4	8	8	8	0	0	0
Amberjacks	17	17	17	17	26	21	0	0	4	4	4	9
Other tilefishes	13	17	17	26	22	22	17	13	13	13	13	9
Other reef fishes	0	0	0	0	0	0	0	0	0	4	4	4
King mackerel	107	52	52	21	13	4	0	0	9	17	39	89
Sharks	4	0	0	0	0	0	0	0	0	0	0	0
Spiny lobster	39	39	34	0	4	9	9	64	55	51	42	38
Stone crab	46	41	41	33	25	4	4	9	9	46	50	50
Tuna	4	4	4	4	4	0	4	4	4	4	4	9
Other non reef fishes	20	20	16	20	50	41	29	33	17	8	8	20
Charter boat fishing	4	4	4	4	4	4	4	4	4	9	9	9

Boats that targeted yellowtail snapper also fished for other species. Alternatives included black grouper or mutton snapper year-round with peak activity between January and March, gray snapper in the summer, especially in June and July, spiny lobster between August and March, stone crab between October and May, and king mackerel in the winter, especially in December and January (Table 27).

Spiny lobster (Tables 28–29) was cited second most frequently as being the most important species in terms of annual revenues (Table 19), and averaged higher net returns than any other kind of fishing trip examined in this study (Table 23). After deducting routine trip costs, boat owners, captains, and crew members shared $1,838 per trip, which was five times greater than net operating revenues on yellowtail snapper trips. Although lobster trips were nearly twice as long, on average, as yellowtail snapper trips and carried a relatively large number of persons aboard, average net returns for lobster trips evaluated per day fished and per person per day were more than three times higher than for yellowtail snapper trips. High net returns on spiny lobster trips were due to both a high average catch per trip and high ex-vessel price. Boats averaged 659 pounds of lobsters worth $2,383 per trip (Table 28).

Lobsters were targeted between August and March, with the estimated number of boats declining as the season progressed. Boats averaged 40 spiny lobster trips per year and earned $47,552 per year to be shared by boat owners, captains, and crew members (Table 29).

Greater amberjack fishing (Tables 30–32) was the highest volume activity examined in this study. On average, boats landed 1,212 pounds on trips that averaged only one day's duration (Table 30). The high volume of landings enabled greater amberjack to produce higher net returns than other reef fishes despite the relatively low ex-vessel price per pound. Boat owners, captains, and crew members shared $206 per person per day fished (Table 30) and $14,912 per boat per year (Table 31) after deducting routine trip costs; these were the highest returns among the activities for reef fishes examined in this study (Table 23). It was estimated that boats in the sampled population landed nearly 0.9 million pounds of greater amberjack on trips for which it contributed the greatest portion of total revenues per trip (Table 32). Boats fished for greater am-

Table 28

Estimated means and standard errors per boat per trip in the Florida Keys when spiny lobster made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of spiny lobster	8	3,000	659	330	–216	1,535
Total pounds, all species	8	3,000	659	330	–216	1,535
Percent pounds by spiny lobster	8	100	100	0	100	100
Revenue from spiny lobster	8	11,250	2,383	1,242	–919	5,685
Total revenue, all species	8	11,250	2,383	1,242	–919	5,685
Percent revenue by spiny lobster	8	100	100	0	100	100
Routine trip costs	8	2,507	545	288	–199	1,289
Cost as percent of total revenue	8	63	21	6	5	37
Net to boat, captain, and crew	8	8,743	1,838	969	–759	4,434
Payment to boat owner	8	5,561	824	656	–921	2,569
Payment to captain	8	1,064	625	134	297	954
Payment to crew	8	2,121	388	245	–252	1,028
Days fished	8	8	2.6	0.9	0.4	4.8
Number of persons aboard	7	4	2.3	0.3	1.4	3.2
Pounds (all species) per day fished	8	400	215	41	112	317
Net revenue per day fished per trip	8	1,182	627	133	299	954
Net revenue per person per day	7	1,000	363	109	29	698

Table 29

Estimated means and standard errors per boat per year in the Florida Keys when spiny lobster made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of spiny lobster	8	51,600	16,480	6,130	359	32,601
Total pounds, all species	8	51,600	16,480	6,130	359	32,601
Percent pounds by spiny lobster	8	100	100	0	100	100
Revenue from spiny lobster	8	154,800	56,012	19,918	6,401	105,622
Total revenue, all species	8	154,800	56,012	19,918	6,401	105,622
Percent revenue by spiny lobster	8	100	100	0	100	100
Routine trip costs	8	32,591	8,460	3,594	–786	17,707
Cost as percent of total revenue	8	63	21	6	5	37
Net to boat, captain, and crew	8	152,478	47,552	18,090	249	94,855
Payment to boat owner	8	72,293	12,343	8,457	–10,105	34,792
Payment to captain	8	137,256	27,749	14,259	–23,033	78,532
Payment to crew	8	27,573	7,459	3,363	–883	15,801
Number of trips	8	129	40	13	–1	82
Days fished	8	129	65	13	30	100

berjack during the spring, with the greatest number of them fishing in May (Table 20). Participation in the fishery was limited by regulations that prohibited commercial sales of greater amberjack in April during the spawning period.[9]

Trips for black grouper and/or mutton snapper (Tables 33–35) were related in several respects to trips for yellowtail snapper. Black grouper and mutton snapper were the two species most frequently cited as incidental catches on yellowtail snapper trips, and yellowtail snap-

Table 30

Estimated means and standard errors per boat per trip in the Florida Keys when greater amberjack made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of greater amberjack	8	3,000	1,135	315	364	1,905
Total pounds, all species	8	3,000	1,212	302	471	1,954
Percent pounds by greater amberjack	8	100	90	5	78	103
Revenue from greater amberjack	8	1,650	652	157	266	1,037
Total revenue, all species	8	1,650	765	148	399	1,131
Percent revenue by greater amberjack	8	100	85	7	68	102
Routine trip costs	8	340	202	38	105	298
Cost as percent of total revenue	8	180	47	19	–26	120
Net to boat, captain, and crew	8	1,400	563	132	239	888
Payment to boat owner	7	700	173	87	–51	397
Payment to captain	8	520	258	66	49	468
Payment to crew	8	350	153	42	48	258
Days fished	8	1	1.0	0.0	1.0	1.0
Number of persons aboard	8	3	2.5	0.3	1.8	3.2
Pounds (all species) per day fished	8	3,000	1,212	302	471	1,954
Net revenue per day fished per trip	8	1,400	563	132	239	888
Net revenue per person per day	8	467	206	45	93	318

Table 31

Estimated means and standard errors per boat per year in the Florida Keys when greater amberjack made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of greater amberjack	8	79,000	26,749	8,088	6,589	46,910
Total pounds, all species	8	86,900	29,595	8,626	8,249	50,940
Percent pounds by greater amberjack	8	100	90	5	78	103
Revenue from greater amberjack	8	63,200	17,576	6,392	1,481	33,672
Total revenue, all species	8	71,100	21,461	7,083	3,946	38,977
Percent revenue by greater amberjack	8	100	85	7	68	102
Routine trip costs	8	23,305	6,549	2,511	350	12,748
Cost as percent of total revenue	8	180	47	19	–26	120
Net to boat, captain, and crew	8	47,795	14,912	4,739	3,157	26,667
Payment to boat owner	7	10,500	3,359	1,353	–160	6,879
Payment to captain	8	24,095	6,861	2,461	629	13,093
Payment to crew	8	23,700	5,113	2,524	–1,278	11,504
Number of trips	8	79	25	8	6	44
Days fished	8	79	25	8	6	44

per was one of the most common incidentally caught species on black grouper or mutton snapper trips.

Catches, revenues, and net returns were comparable. Boats landed an average of 209 pounds of fish per trip worth $438, with approximately 73% of the pounds and 77% of the revenues from black grouper, red grouper, or mutton snapper (Table 33). Although the average net return of $323 per trip was about the same as on yellowtail snapper trips, black grouper or mutton snapper trips were slightly shorter and carried slightly fewer

Table 32

Estimated totals for all boats in sampled portion of the reef fish fishery when greater amberjack made the greatest contribution to trip revenue.

Variable	Sample size	Average per boat per year	Estimated number of boats	Estimated total for all boats	Std. error of total	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of greater amberjack	8	26,749	33	893,559	404,286	−159,505	1,946,622
Total pounds, all species	8	29,595	33	988,608	439,640	−165,158	2,142,374
Revenue from greater amberjack	8	17,576	33	587,132	290,131	−191,910	1,366,173
Total revenue, all species	8	21,461	33	716,912	336,415	−192,774	1,626,599
Routine trip costs	8	6,549	33	218,767	110,820	−86,810	524,345
Net to boat, captain, and crew	8	14,912	33	498,145	229,910	−115,852	1,112,142
Payment to boat owner	7	3,359	29	98,140	52,441	−47,458	243,739
Payment to captain	8	6,861	33	229,198	113,306	−55,309	513,705
Payment to crew	8	5,113	33	170,806	101,501	−109,066	450,678
Number of trips	8	25	33	840	382	−176	1,855
Days fished	8	25	33	840	382	−176	1,855

Table 33

Estimated means and standard errors per boat per trip in the Florida Keys when mutton snapper or black or red grouper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of black grouper/mutton snapper	26	800	149	40	66	232
Total pounds, all species	26	1,200	209	58	87	332
Percent pounds by black grouper/mutton snapper	26	100	73	5	62	83
Revenue from black grouper/mutton snapper	26	1,770	323	88	140	506
Total revenue, all species	26	2,712	438	128	166	709
Percent revenue by black grouper/mutton snapper	26	100	77	4	68	85
Routine trip costs	26	795	114	31	49	180
Cost as percent of total revenue	26	103	36	4	27	44
Net to boat, captain, and crew	26	1,958	323	103	106	541
Payment to boat owner	26	479	51	20	9	94
Payment to captain	26	979	167	43	77	257
Payment to crew	26	979	105	52	−6	215
Days fished	26	8	1.4	0.3	0.8	2.0
Number of persons aboard	26	3	1.7	0.1	1.5	2.0
Pounds (all species) per day fished	26	1,000	149	37	70	228
Net revenue per day fished per trip	26	1,958	225	72	69	381
Net revenue per person per day	26	979	134	37	55	213

persons aboard. Hence, the average net return per person per day fished was higher (Table 23). Boats took an average of 33 trips per year for black grouper and/or mutton snapper, which produced an average of $9,062 per year to be shared by owner, captain, and crew (Table 34). It is estimated that, in aggregate, they landed approximately 0.7 million pounds of fish worth $1.4 million (Table 35).

Although gray (mangrove) snapper (Tables 36–38) is one of the most common species in the Keys, net operating revenues were lower than for the other reef fishes examined in this report because catch rates and dockside prices were relatively low. Respondents landed an average of 163 pounds of fish worth $301 per trip (Table 36). After accounting for variation in crew size and trip duration, boat owners, captains, and crew members

Table 34

Estimated means and standard errors per boat per year in the Florida Keys when mutton snapper or black or red grouper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of black grouper/mutton snapper	26	26,000	4,462	1,400	1,489	7,436
Total pounds, all species	26	36,400	6,293	1,854	2,394	10,192
Percent pounds by black grouper/mutton snapper	26	100	73	5	62	83
Revenue from black grouper/mutton snapper	26	58,200	9,700	2,992	3,368	16,033
Total revenue, all species	26	61,440	12,714	3,573	5,265	20,163
Percent revenue by black grouper/mutton snapper	26	100	77	4	68	85
Routine trip costs	26	25,272	3,652	1,144	1,216	6,089
Cost as percent of total revenue	26	103	36	4	27	44
Net to boat, captain, and crew	26	46,440	9,062	2,607	3,657	14,466
Payment to boat owner	26	10,504	1,355	527	209	2,500
Payment to captain	26	34,020	5,599	1,666	2,137	9,060
Payment to crew	26	19,580	2,108	962	115	4,101
Number of trips	26	104	33	7	19	47
Days fished	26	148	38	8	22	55

Table 35

Estimated totals for all boats in sampled portion of the reef fish fishery when mutton snapper or black or red grouper made the greatest contribution to trip revenue.

Variable	Sample size	Average per boat per year	Estimated number of boats	Estimated total for all boats	Std. error of total	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of black grouper/mutton snapper	26	4,462	112	498,635	173,569	129,627	867,642
Total pounds, all species	26	6,293	112	703,172	234,063	211,289	1,195,056
Revenue from black grouper/mutton snapper	26	9,700	112	1,083,916	372,290	295,002	1,872,830
Total revenue, all species	26	12,714	112	1,420,630	456,212	468,185	2,373,075
Routine trip costs	26	3,652	112	408,088	141,556	105,920	710,255
Net to boat, captain, and crew	26	9,062	112	1,012,542	332,305	322,461	1,702,624
Payment to boat owner	26	1,355	112	151,378	62,279	13,881	288,876
Payment to captain	26	5,599	112	625,585	212,029	184,656	1,066,514
Payment to crew	26	2,108	112	235,579	113,953	–812	471,970
Number of trips	26	33	112	3,677	938	1,729	5,626
Days fished	26	38	112	4,266	1,095	1,973	6,559

shared an average of only $76 per person per day fished (Table 36) and $4,469 per boat per year (Table 37) after deducting routine trip costs. It was estimated that boats on gray snapper trips landed 0.3 million pounds of fish worth nearly $0.6 million (Table 38). Gray snapper were targeted throughout the year, but primarily between May and August (Table 20).

Other, less frequently targeted species included the deep water groupers and tilefishes (Tables 39–41), of which snowy grouper and blueline tilefish were the most common. Average net operating revenues on deep water reef fish trips were lower than on yellowtail snapper trips (Table 23). Boat owners, captains, and crew members shared an average of $107 per person per day fished after deducting routine trip costs. The estimated 46 boats that targeted deep water groupers and tilefishes landed an estimated 0.25 million pounds worth approximately $0.37 million (Table 41), and returned $5,049 per boat per year to be shared by owners, captains, and crew members (Table 40). Fishing for deep

Table 36

Estimated means and standard errors per boat per trip in the Florida Keys when gray snapper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of gray snapper	20	270	115	18	77	154
Total pounds, all species	20	600	163	30	98	227
Percent pounds by gray snapper	20	100	73	5	63	83
Revenue from gray snapper	20	540	216	37	138	294
Total revenue, all species	20	1,200	301	62	167	436
Percent revenue by gray snapper	20	100	74	4	66	83
Routine trip costs	20	415	113	23	64	162
Cost as percent of total revenue	20	233	51	10	27	74
Net to boat, captain, and crew	20	785	195	43	102	289
Payment to boat owner	20	262	49	15	17	82
Payment to captain	20	261	89	17	53	125
Payment to crew	20	262	57	16	23	91
Days fished	20	3	1.3	0.1	1.0	1.6
Number of persons aboard	20	11	2.3	0.4	1.3	3.3
Pounds (all species) per day fished	20	275	125	17	90	161
Net revenue per day fished per trip	20	369	149	27	92	205
Net revenue per person per day	20	185	76	13	47	104

Table 37

Estimated means and standard errors per boat per year in the Florida Keys when gray snapper made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of gray snapper	20	12,000	2,921	724	1,374	4,469
Total pounds, all species	20	16,500	3,968	995	1,860	6,076
Percent pounds by gray snapper	20	100	73	5	63	83
Revenue from gray snapper	20	24,000	5,326	1,400	2,301	8,351
Total revenue, all species	20	34,800	7,055	1,889	2,982	11,129
Percent revenue by gray snapper	20	100	74	4	66	83
Routine trip costs	20	16,200	2,967	979	886	5,047
Cost as percent of total revenue	20	233	51	10	27	74
Net to boat, captain, and crew	20	18,600	4,469	1,107	2,102	6,837
Payment to boat owner	20	6,360	1,131	392	289	1,973
Payment to captain	20	12,240	2,218	642	832	3,604
Payment to crew	20	4,080	1,120	307	461	1,780
Number of trips	20	120	25	6	12	39
Days fished	20	120	28	6	15	41

water species occurred throughout the year with a seasonal peak in April, May, and June, and a seasonal low in August and September (Table 20).

King mackerel trips (Tables 42–43) produced lower net operating revenues, on average, than did trips for any of the reef fishes examined in this study (Table 23). Boat owners, captains, and crew members shared $68 per person per day fished and $2,238 per boat per year after deducting routine trip costs. King mackerel fishing was seasonal, and occurred primarily in December and January (Table 20).

Table 38

Estimated totals for all boats in sampled portion of the reef fish fishery when gray snapper made the greatest contribution to trip revenue.

Variable	Sample size	Average per boat per year	Estimated number of boats	Estimated total for all boats	Std. error of total	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of gray snapper	20	2,921	83	243,440	79,021	75,295	411,585
Total pounds, all species	20	3,968	83	330,664	107,625	103,348	557,979
Revenue from gray snapper	20	5,326	83	443,810	149,832	121,244	766,375
Total revenue, all species	20	7,055	83	587,938	200,353	158,363	1,017,513
Routine trip costs	20	2,967	83	247,206	96,326	43,295	451,116
Net to boat, captain, and crew	20	4,469	83	372,448	121,083	112,821	632,076
Payment to boat owner	20	1,131	83	94,264	38,547	10,337	178,191
Payment to captain	20	2,218	83	184,823	65,917	44,087	325,558
Payment to crew	20	1,120	83	93,362	32,170	22,809	163,915
Number of trips	20	25	83	2,113	661	687	3,540
Days fished	20	28	83	2,357	690	881	3,833

Table 39

Estimated means and standard errors per boat per trip in the Florida Keys when deep water groupers and tilefish made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of deep water reef fishes	11	250	126	22	77	174
Total pounds, all species	11	545	166	41	71	262
Percent pounds by deep water reef fishes	11	100	88	6	73	102
Revenue from deep water reef fishes	11	456	210	42	116	305
Total revenue, all species	11	782	257	59	120	394
Percent revenue by deep water reef fishes	11	100	88	6	74	102
Routine trip costs	11	330	95	23	38	152
Cost as percent of total revenue	11	154	53	12	25	82
Net to boat, captain, and crew	11	452	162	42	66	258
Payment to boat owner	10	151	46	18	3	89
Payment to captain	11	205	75	20	27	122
Payment to crew	11	150	45	16	8	83
Days fished	10	1	1.0	0.0	1.0	1.0
Number of persons aboard	11	2	1.6	0.2	1.3	2.0
Pounds (all species) per day fished	10	545	172	45	61	282
Net revenue per day fished per trip	10	452	173	45	68	278
Net revenue per person per day	10	226	107	28	42	171

Average net operating revenues on dolphin trips (Tables 44–45) were the lowest from among the alternatives examined in this study (Table 23). Boat owners, captains, and crew members shared only $45 per person per day fished and $2,236 per boat per year after deducting routine trip costs. Trips on which dolphin was the most important species were made between April and September, with peak fishing activity occurring in May and June.

Discussion

This report describes the financial performance of commercial reef fish boats when participating in different kinds of fishing trips in the Florida Keys. The survey confirmed that commercial fishermen in the Keys usually were generalists rather than specialists. While some boats engaged in only one kind of fishing, most alternated among two or more different kinds of fishing

Table 40

Estimated means and standard errors per boat per year in the Florida Keys when deep water groupers and tilefish made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of deep water reef fishes	11	10,250	3,691	951	1,401	5,981
Total pounds, all species	11	27,250	5,430	2,126	60	10,800
Percent pounds by deep water reef fishes	11	100	88	6	73	102
Revenue from deep water reef fishes	11	22,800	6,302	1,822	1,913	10,692
Total revenue, all species	11	39,100	8,147	2,992	643	15,650
Percent revenue by deep water reef fishes	11	100	88	6	74	102
Routine trip costs	11	16,500	3,098	1,246	–133	6,328
Cost as percent of total revenue	11	154	53	12	25	82
Net to boat, captain, and crew	11	22,600	5,049	1,828	607	9,492
Payment to boat owner	10	7,550	1,724	784	–164	3,612
Payment to captain	11	7,550	2,011	591	601	3,420
Payment to crew	11	7,500	1,463	639	–97	3,023
Number of trips	11	86	32	7	16	48
Days fished	10	86	33	7	16	50

Table 41

Estimated totals for all boats in sampled portion of the reef fish fishery when deep water groupers and tilefish made the greatest contribution to trip revenue.

Variable	Sample size	Average per boat per year	Estimated number of boats	Estimated total for all boats	Std. error of total	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of deep water reef fishes	11	3,691	46	169,786	65,040	609	338,962
Total pounds, all species	11	5,430	46	249,751	120,556	–72,716	572,217
Revenue from deep water reef fishes	11	6,302	46	289,890	117,177	–19,842	599,622
Total revenue, all species	11	8,147	46	374,725	173,601	–89,330	838,781
Routine trip costs	11	3,098	46	142,475	70,116	–43,789	328,738
Net to boat, captain, and crew	11	5,049	46	232,251	106,512	–49,985	514,486
Payment to boat owner	10	1,724	42	72,476	38,974	–35,732	180,685
Payment to captain	11	2,011	46	92,478	37,817	–2,535	187,492
Payment to crew	11	1,463	46	67,296	35,046	–21,363	155,956
Number of trips	11	32	46	1,466	522	276	2,657
Days fished	10	33	42	1,416	523	208	2,624

trips. Although we did not inquire about motivations for switching behavior, switching probably occurred for a variety of reasons including disparities in net returns per unit of fishing effort, seasonal availability of fish, regulated openings and closings, experience with alternative kinds of fishing, and so forth.

In the short-term, fishermen maximize profits or minimize losses by taking additional trips for a particular species if expected trip revenues exceed expected variable costs per trip. In theory, fishermen will switch among fishing activities if they expect to earn more in the new fishery than they could in their existing fishery after accounting for switching costs. Over time, disparities among fishing activities in potential net returns per unit of effort tend to disappear because each entrant into the new fishery disperses a portion of the available catch among a greater number of participants, and hence reduces net return per unit of effort. Similarly, each defection from the existing fishery reallocates slightly larger catches to the remaining participants, thereby increasing their net return per unit of effort.

Table 42

Estimated means and standard errors per boat per trip in the Florida Keys when king mackerel made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of king mackerel	7	500	188	62	21	356
Total pounds, all species	7	500	195	61	34	356
Percent pounds by king mackerel	7	100	95	4	85	105
Revenue from king mackerel	7	315	156	41	51	261
Total revenue, all species	8	315	167	35	80	253
Percent revenue by king mackerel	7	100	93	6	74	111
Routine trip costs	8	117	60	10	35	86
Cost as percent of total revenue	8	490	90	52	−98	279
Net to boat, captain, and crew	8	205	106	27	35	177
Payment to boat owner	8	68	15	11	−12	43
Payment to captain	8	146	74	18	23	125
Payment to crew	8	68	17	10	−10	44
Days fished	8	1	1.0	0.0	1.0	1.0
Number of persons aboard	7	4	1.7	0.4	0.5	2.9
Pounds (all species) per day fished	7	500	195	61	34	356
Net revenue per day fished per trip	8	205	106	27	35	177
Net revenue per person per day	7	146	68	20	16	120

Table 43

Estimated means and standard errors per boat per year in the Florida Keys when king mackerel made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of king mackerel	7	16,000	3,959	1,957	−1,567	9,485
Total pounds, all species	7	16,000	4,150	1,943	−1,270	9,569
Percent pounds by king mackerel	7	100	95	4	85	105
Revenue from king mackerel	7	9,600	3,130	1,120	164	6,095
Total revenue, all species	8	9,600	3,318	1,033	775	5,862
Percent revenue by king mackerel	7	100	93	6	74	111
Routine trip costs	8	3,040	1,080	302	332	1,828
Cost as percent of total revenue	8	490	90	52	−98	279
Net to boat, captain, and crew	8	6,560	2,238	757	382	4,095
Payment to boat owner	8	2,176	320	262	−366	1,006
Payment to captain	8	4,380	1,581	497	366	2,796
Payment to crew	8	2,176	338	259	−346	1,021
Number of trips	8	32	18	3	10	26
Days fished	8	32	18	3	10	26

In practice, net returns probably never will be truly equalized due to a variety of impediments to switching. For example, imperfect information about opportunities in alternative kinds of fishing, the need for capital investment in specialized gear, or the lack of experience with alternative fishing techniques may preclude some fishermen from switching. And geographic, seasonal, or regulatory restrictions may limit switching behavior that would tend to equalize net returns per unit of effort.

Table 44

Estimated means and standard errors per boat per trip in the Florida Keys when dolphin made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per trip	Average per boat per trip	Std. error per boat per trip	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of dolphin	6	200	92	24	21	163
Total pounds, all species	6	235	104	27	23	186
Percent pounds by dolphin	6	100	88	9	56	120
Revenue from dolphin	6	400	145	49	–8	298
Total revenue, all species	6	442	165	52	–5	335
Percent revenue by dolphin	6	100	88	9	53	123
Routine trip costs	6	101	77	8	54	100
Cost as percent of total revenue	6	149	69	18	17	120
Net to boat, captain, and crew	6	342	88	49	–68	245
Payment to boat owner	5	114	41	21	–28	110
Payment to captain	6	114	34	20	–20	89
Payment to crew	6	114	20	17	–41	82
Days fished	6	1	1.0	0.0	1.0	1.0
Number of persons aboard	6	3	2.0	0.2	1.0	3.0
Pounds (all species) per day fished	6	235	104	27	23	186
Net revenue per day fished per trip	6	342	88	49	–68	245
Net revenue per person per day	6	126	45	22	–20	111

Table 45

Estimated means and standard errors per boat per year in the Florida Keys when dolphin made the greatest contribution to trip revenue.

Variable	Sample size	Maximum per boat per year	Average per boat per year	Std. error per boat per year	Lower 95% conf. limit	Upper 95% conf. limit
Pounds of dolphin	6	6,200	2,092	892	–429	4,613
Total pounds, all species	6	7,285	2,308	1,015	–612	5,229
Percent pounds by dolphin	6	100	88	9	56	120
Revenue from dolphin	6	12,400	3,398	1,718	–1,752	8,548
Total revenue, all species	6	13,702	3,688	1,879	–2,046	9,422
Percent revenue by dolphin	6	100	88	9	53	123
Routine trip costs	6	3,780	1,452	575	–194	3,097
Cost as percent of total revenue	6	149	68	18	17	120
Net to boat, captain, and crew	6	10,602	2,236	1,525	–2,898	7,371
Payment to boat owner	5	3,534	1,023	618	–1,003	3,048
Payment to captain	6	3,534	804	499	–855	2,463
Payment to crew	6	3,534	580	525	–1,335	2,494
Number of trips	6	45	18	6	0	35
Days fished	6	45	18	6	0	35

Regulation of one kind of fishing activity often precipitates a transfer of fishing effort to other species, some of which may be overfished or nearly overfished. These data can be used to model the supply of fishing effort to help predict the effects of regulation, including possible switching behavior among different kinds of fishing.

The different kinds of fishing examined in this study included trips for yellowtail snapper, black grouper or mutton snapper, greater amberjack, gray snapper, deep

water groupers and tilefishes, spiny lobster, king mackerel, and dolphin. Several of the reef fish species such as yellowtail snapper and black grouper are available year-round, while others such as greater amberjack, mutton snapper, and gray snapper are available in seasons that probably correspond with aggregations of spawning fish. Spiny lobster and king mackerel are available during regulated seasons. Each kind of fishing was evaluated by comparing average net operating revenues per trip as a measure of the combined share payments to boat owner, captain, and crew after deducting routine trip expenses.

Spiny lobster produced the highest average share payments per trip from among the kinds of fishing examined in this study, due to high catch rates and high dockside prices. About 20% of the sampled boats participated in the spiny lobster fishery despite the need for trap certificates, which are marketable fishing privileges issued by the state of Florida, and lobster traps and trap pullers as specialized gear. Fishing effort in the spiny lobster fishery was greatest in August at the beginning of the season and tended to shift to stone crab when its season opened or to reef fishes and other species as lobster densities and catch rates declined.

We were surprised to find that greater amberjack trips yielded higher average share payments per trip than other kinds of fishing for reef fishes. Net operating revenues were high, on average, because low ex-vessel prices were more than offset by large catches per trip. Despite high net returns per trip, the estimated participation levels such as numbers of boats and trips were relatively low, probably due to the seasonal nature of greater amberjack abundance and regulatory restrictions during the peak months of abundance.

The yellowtail snapper resource supported the principal kind of fishing among reef fish boats in the Keys. More than 80% of the sampled boats fished for yellowtail snapper at some time during the year, with most of them ranking it as their most important source of revenue on an annual basis. The high rate of participation in the yellowtail snapper fishery probably reduced average share payments by splitting the overall catch among the competing trips.

Trips for black grouper or mutton snapper were the next most frequently cited kind of fishing in our sample. Given the year-round availability of black grouper and mutton snapper as primary or secondary species, we expected some boats to switch between black grouper/mutton snapper trips and yellowtail snapper trips with the result that average net returns per unit of effort would tend to equality. In fact, the estimated average net operating revenues per trip were approximately equal even though average net operating revenues per day fished and per person per day fished were higher for black grouper than for yellowtail snapper.

In addition to their descriptive value, these data can be used in future analyses of regulation in the reef fish fishery. The economic effects of regulation on commercial fishermen are measured as changes in producers' surplus, loosely defined as payments earned by capital and labor in excess of their opportunity costs. Ideally, changes in producers' surplus would be calculated as the lesser of the change in producers' surplus in the regulated fishery, or the reduction in producers' surplus between the regulated fishery and the next-best alternative kind of fishing. For example, the economic effects of seasonal closures would be the loss of producers' surplus in the closed fishery if no alternative kind of fishing existed during the closed season, or the reduction in producers' surplus between the closed and alternative fisheries if an alternative existed.

Financial performance was reported in terms of net operating revenues to boat owner, captain, and crew (i.e., total share payments), which differs from producers' surplus. Opportunity costs should be deducted from net operating revenues to obtain a measure of producers' surplus. Opportunity costs are determined by the next-best earnings opportunities, such as the major local industry, available to fishermen. These opportunities vary geographically, and their determination is an important topic for future research.

In conclusion, this study provides a snapshot of the financial performance of commercial reef fish boats on different kinds of fishing trips in the Florida Keys. The research can assist fishery managers in evaluating the consequences of regulation in the commercial reef fish fishery. While it cannot be claimed that these data and analyses will alter regulation in the reef fish fishery, it is our belief that this information will enable fishery managers to make better-informed decisions among regulatory alternatives.

Acknowledgements

This study would not exist except for the substantial efforts by hundreds of individuals, including data collectors and respondents. Field supervisors, interviewers, editors, and data-entry personnel performed an outstanding job in a difficult task. Staats Abrams and Gerry Kremenko, from Crossley Surveys, a division of Roper Starch Worldwide, Inc., supervised the collection of data and the data entry process. The data collection phase of this study was funded by the National Marine Fisheries Service through contract 50WCNF306028 with Roper Starch Worldwide, Inc., and MARFIN award NA47FS0014 with the South Carolina Department of Natural Resources.

We are especially thankful to the fishermen who as a group spent hundreds of hours being interviewed. One hundred two fishermen were interviewed over a wide

geographic region, and many were contacted again by telephone to check responses that may have seemed unusual or inconsistent with answers to other questions. Their patience and willingness to provide information about themselves and their fishing activities have led to a better understanding of the financial aspects of commercial fishing for reef fishes.

Also, we thank two anonymous reviewers for their helpful comments and suggestions.

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Appendix 1

Survey Questionnaires: Screening Questionnaire, Basic Questionnaire, Supplemental Questionnaire

ID #:_____

CROSSLEY SURVEYS
275 Madison Avenue
New York, NY 10016

FLORIDA KEYS COMMERCIAL FISHERMEN SURVEY
(Screening Questionnaire)

#444-361
NA47FF0014
June, 1994

107 = 1

DIALING EXPERIENCE

Attempt No.	Date	Time	Result: Disc.	No Ans.	Busy	NAH	Ref.	Other (Specify)	Succ. Cont.
1	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
2	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
3	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
4	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
5	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
6	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
7	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]
8	____	____	[ ]	[ ]	[ ]	[ ]	[ ]	_____	[ ]

Hello. I am _____ of Crossley Surveys, an independent survey research firm. We are conducting a survey on behalf of the Division of Marine Resources, South Carolina Department of Natural Resources and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

This survey is being conducted to provide federal regulators with information concerning the financial situation of commercial fishermen who fish for reef fish such as snapper, grouper, amberjack, porgy, sea bass, tilefish, hogfish and triggerfish. As you know, decisions are being made for managing reef fisheries in Federal waters of the U.S. South Atlantic and Gulf of Mexico. Your input will help to identify potential economic effects of fishery management regulations that might be proposed by the Federal government.

Your boat, having Vessel Registration Number **(READ NUMBER)**, was randomly selected from a list of federal permit holders who fish commercially for snapper, grouper and other reef fish. Your responses will be kept strictly confidential and will be combined with the responses of other commercial fishermen. When the data are presented, they will be in the form of group totals and averages so there will be no way of tracing responses back to you or that boat.

The survey is voluntary, but we urge you to participate. We need your answers. Fishermen like yourself, who have a vital stake in the management decisions being made, can provide the information necessary to evaluate the economic effects of different management options on commercial reef fishermen.

The interview can take about 90 minutes. The purpose of this call is to set up an appointment with you at your convenience to meet with you in person to conduct this interview. It may be helpful to you to have your records available in case you need to refer back to them for catch, revenue and cost data relating to the boat we selected.

1a. First, did you fish commercially for reef fish such as snapper, grouper, amberjack, porgy, sea bass, tilefish hogfish or triggerfish during 1993?
Yes 1 (1c)
No 2 (1b)
108

b. Why didn't you fish commercially for reef fish during 1993?

_____ 109-118

_____

_____

_____

c. Have you been fishing for reef fish this year - 1994?
Yes 1 (INSTRUCTION BEFORE Q.2)
No 2 (1d)
119

(OVER)

1d. Why aren't you fishing commercially for reef fish this year?

_____ 120:129
_____
_____
_____

IF "NO" TO Q.1a, SKIP TO Q.5

2. (Not applicable)

130:138 = BLANK

3. Did the total sale of your reef fish catch during 1993 account for at least 5% of your total 1993 gross revenue from commercial fishing? 139

Yes	1	
No	2	(5)

4. Now, let's set up that appointment.

- **MAKE AN APPOINTMENT AT A TIME CONVENIENT TO HIM/HER. ALSO, RECORD THE ADDRESS OF THE PLACE WHERE THE INTERVIEW IS TO TAKE PLACE.**

_____ (DATE) _____ (DAY) _____ (TIME)

ADDRESS:_____

5. VERIFY IDENTIFICATION DATA

IDENTIFICATION DATA

Respondent (Owner):_____ Telephone No.:_____ 140:149

Address:_____

City:_____ State:_____ Zip:_____ 150:151

Other Respondent:_____ Telephone No.:_____

Interviewer:_____ 152:154 Date:_____ 155:160 Val.by:_____

Vessel Name:_____ Home Port:_____ 161:162 (CITY/STATE) 163:164

Vessel Registration No.:_____ 165:174 Operator:_____

Primary Gear Type:_____ 175:177 Survey Region:_____ 178:179 ID #:_____ 180:183

IF "NO" TO QUESTION 1A OR "NO" TO Q.3, TERMINATE.

6. If requested, we would be glad to mail you a summary report of key findings early in 1995. **(CHECK HERE [ ] IF REPORT IS WANTED.)** 184

ID #:_____

CROSSLEY SURVEYS
275 Madison Avenue
New York, NY 10016

START TIME:_____

SOUTH ATLANTIC/FLORIDA KEYS COMMERCIAL FISHERMEN SURVEY
(Basic Questionnaire)

#444-360/61
June, 1994

1a. **(SHOW CARD A)** One of the boats selected for this survey has **(VESSEL REGISTRATION NUMBER)** as its Vessel Registration Number. Which one of the statements on this card best describes your position on that boat?

Owner and captain	1	(1b)
Owner, but not captain	2	(1b)
Captain, but not owner	3	(1b)
None of the above	4	(T)

207

b. For how many years have you been an/a **(POSITION CIRCLED IN Q.1a)** of this boat or any other boat? #_____years

208:209

2a. In which of the following areas did this boat fish commercially for reef fish such as snapper, grouper, sea bass, amberjack, porgy, tilefish, hog fish or trigger fish during 1993? Did it fish off ..... **(READ LIST AND CIRCLE ALL THAT APPLY)**

The Carolinas	1	
Georgia	1	
Atlantic side of Florida	1	
Atlantic side of the Florida Keys	1	
Gulf of Mexico side of the Florida Keys	1	
Other areas in the Gulf of Mexico	1	
None of the above	1	(T)

210:216

b. **(IF "1" OR "2" CIRCLED IN Q.1a, ASK:)** How many boats do you own that are used for commercial fishing along the South Atlantic Coast, Florida Keys or in the Gulf of Mexico? #_____boats

217:219

c. **(IF 2 OR MORE IN Q.2b, ASK Q.2c FOR EACH LISTED AREA:)** How many fish commercially in (AREA)?
#_____ South Atlantic Coast #_____ Florida Keys #_____ Gulf

220:228

3a. For how many years have you been a commercial fisherman? #_____years

229:230

b. **(SHOW CARD B)** Which statements on this card describe the type of commercial fisherman you are? Select as many as apply. **(CIRCLE BELOW UNDER COL.3b)**

c. **(IF MORE THAN ONE STATEMENT CIRCLED IN Q.3b, ASK:)** How did your 1993 total gross revenue breakdown percentagewise by these fishing activities? **(RECORD BELOW UNDER COL.3c)**

	(3b)	(3c) %	
Fish commercially for reef fish along the South Atlantic Coast	1	_____	* 231,232:234
Fish commercially for other species along the South Atlantic Coast	1	_____	235,236:238
Fish commercially for reef fish in the Florida Keys	1	_____	* 239,240:242
Fish commercially for other species in the Florida Keys	1	_____	243,244:246
Fish commercially for reef fish in the Gulf of Mexico	1	_____	* 247,248:250
Fish commercially for other species in the Gulf of Mexico	1	_____	251,252:254
Charter/head boat operator	1	_____	255,256:258
Other (SPECIFY):_____	1	_____	259:261,262:264

MUST ADD TO -------> 100%

*** VERIFY IF SUM TOTAL NOT AT LEAST 5%. IF LESS THAN 5%, TERMINATE AND NOTE SUCH ON SCREENER.**

4. Taking into account all the different kinds of commercial fishing you have done, what are all the ports you have worked from in the past 10 years starting with the most recent years, and the years you worked out of each one? **(RECORD CITY AND STATE)**

City	State	Years	
_____	_____	_____	265:267,268:269
_____	_____	_____	270:272,273:274
_____	_____	_____	275:277,278:279
_____	_____	_____	280:282,283:284

5. **(SHOW CARD C)** Again, taking into account all the different kinds of commercial fishing you have done, which types of gear have you ever used for commercial fishing?

Bottom long lines	1	285:292	Spears w/power heads	1	293:306
Bandit reels (including electric & hydraulic)	1		Lobster/crab traps	1	
Surface long lines	1		Trolling lines	1	
Hand held electric reels	1		Rod & reel	1	
Sea bass traps/pots	1		Shrimp trawls	1	
Other fish traps/pots	1		Other (SPECIFY):	1	
Gill nets	1				
Spear fishing (w/o power heads)	1		_____		307:316

6a. **(SHOW CARD D)** Which of these fish or shell fish have you ever targeted as the main or primary catch when fishing commercially? Do not include incidental catches. **(CIRCLE UNDER COL.6a)**

b. **(SHOW CARD E AND FOR EACH KIND CIRCLED IN COL.6a, ASK:)** During which of these years was (KIND) a main or primary catch when fishing commercially? **(CIRCLE UNDER COL.6b)**

c. **(IF MORE THAN ONE BOAT OWNED - Q.2b, ASK:)** Which of these kinds of fish or shell fish were the main or primary catch during 1993 for the boat selected for this survey? **(READ KINDS CIRCLED UNDER 1993 COLUMN AND CIRCLE RESPONSES UNDER "1993 - SAMPLE BOAT ONLY.")**

d. **(IF 2 OR MORE MAIN/PRIMARY CATCHES CIRCLED UNDER COL.1993 OR COL.6c, ASK:)** Which main catch from the boat selected for this survey brought in the most revenue during 1993? **(RECORD "1" OPPOSITE THE CATCH UNDER COL.6d)** Which catch from this boat brought in the next most revenue during 1993? **(RECORD BELOW "2" OPPOSITE THE CATCH. CONTINUE UNTIL ALL MAIN CATCHES OF SAMPLE BOAT DURING 1993 ARE IN RANK ORDER.)**

IF NO SPECIES CIRCLED UNDER COL.1993 OR COL.6c IN THE "OTHER KINDS" BOX IN THE Q.6 GRID ON THE NEXT PAGE, SKIP TO INSTRUCTION BOX BELOW.

e. You mentioned that the sample boat targeted fish other than reef fish during 1993 as a main catch. With which of these other kinds of main catches, if any, were reef fish a significant incidental catch? **(CIRCLE BELOW UNDER COL.6e)**

None 0 **(INSTRUCTION BOX BELOW)**

f. **(IF 2 OR MORE OTHER KINDS CIRCLED UNDER COL.6e, ASK:)** With which kind did the incidental reef fish catch contribute the most revenue during 1993? **(RECORD "1" OPPOSTE THAT CATCH UNDER COL.6f)** With which kind did the incidental reef fish catch contribute the next highest revenue during 1993? **(RECORD "2" OPPOSITE THAT CATCH UNDER COL.6f. CONTINUE UNTIL ALL KINDS CIRCLED IN COL.6e ARE RANKED.)**

Other Kinds	Circled Under Col.1993 or Col.6c	317:324	(6e) Had Significant Incidental Catch of Reef Fish	325:332	(6f) Rank Order Importance By Revenue	333:340
King Mackerel	1		1		____	
Shark	1		1		____	
Spiny Lobster	1		1		____	
Stone Crabs	1		1		____	
Tuna	1		1		____	
Swordfish	1		1		____	
Shrimp	1		1		____	
Other nonreef fish	1		1		____	

- **ADMINISTER A GREEN QUESTIONNAIRE FOR EACH OF THE TWO MOST IMPORTANT CATCHES IN THE "REEF FISH" BOX FOR THE SAMPLE BOAT (Q.6d).**
- **IF THE 2 MOST IMPORTANT ARE NOT FISHED FOR ON SEPARATE TRIPS, COMPLETE ONE GREEN QUESTIONNAIRE FOR THE "COMBINED TRIP" AND A SECOND GREEN QUESTIONNAIRE FOR THE 3RD MOST IMPORTANT REEF FISH.**
- **IF ONLY ONE KIND OF REEF FISH WAS THE MAIN CATCH FOR THE SAMPLE BOAT IN 1993 (COL.6c), COMPLETE GREEN QUESTIONNAIRES FOR IT AND FOR THE CATCH LISTED IN COL.6f ABOVE HAVING THE MOST IMPORTANT (#1) INCIDENTAL CATCH OF REEF FISH.**
- **IF NO REEF FISH WERE A MAIN CATCH FOR THE SAMPLE BOAT IN 1993 (COL.6c), ADMINISTER GREEN QUESTIONNAIRES FOR THE CATCHES RANKED #1 AND #2 IN COL.6f ABOVE.**
- **IF ALL THE ABOVE INSTRUCTIONS YIELD ONLY ONE GREEN QUESTIONNAIRE, COMPLETE A SECOND GREEN QUESTIONNAIRE FOR THE MAIN CATCH IN THE "OTHER KIND BOX" MAKING THE MOST OR NEXT MOST IMPORTANT CONTRIBUTION TO REVENUE (6d).**
- **AFTER THE 2 GREEN QUESTIONNAIRES ARE COMPLETED, CONTINUE WITH Q.7 ON PAGE 4.**

		(5a)	(6b)				(6c)	(6d)
			YEARS DONE COMMERCIALLY					
	MAIN/PRIMARY CATCH (DO NOT INCLUDE INCIDENTAL OR BY CATCHES)	EVER DONE	1990	1991	1992	1993	* 1993 SAMPLE BOAT ONLY	RANK ORDER IMP. BY REVENUE
	BLACK GROUPER	1	1	1	1	1	1	___
	GAG	1	1	1	1	1	1	___
	RED GROUPER	1	1	1	1	1	1	___
	SCAMP	1	1	1	1	1	1	___
	SNOWY GROUPER	1	1	1	1	1	1	___
	SPECKLED HIND GROUPER	1	1	1	1	1	1	___
R	YELLOWEDGE GROUPER	1	1	1	1	1	1	___
E	WARSAW GROUPER	1	1	1	1	1	1	___
E	OTHER GROUPER	1	1	1	1	1	1	___
F								
	GRAY SNAPPER	1	1	1	1	1	1	___
	HOG SNAPPER	1	1	1	1	1	1	___
	MUTTON SNAPPER	1	1	1	1	1	1	___
F	RED SNAPPER	1	1	1	1	1	1	___
I	VERMILION (B-LINERS) SNAPPER	1	1	1	1	1	1	___
S	YELLOWTAIL SNAPPER	1	1	1	1	1	1	___
H	OTHER SNAPPER	1	1	1	1	1	1	___
	AMBERJACK	1	1	1	1	1	1	___
	PORGIES	1	1	1	1	1	1	___
	SEA BASS	1	1	1	1	1	1	___
	GOLDEN TILEFISH	1	1	1	1	1	1	___
	OTHER TILEFISH	1	1	1	1	1	1	___
	TRIGGERFISH	1	1	1	1	1	1	___
	OTHER REEF FISH	1	1	1	1	1	1	___
O								
T								
H	KING MACKEREL	1	1	1	1	1	1	___
E	SHARK	1	1	1	1	1	1	___
R	SPINY LOBSTER	1	1	1	1	1	1	___
	STONE CRABS	1	1	1	1	1	1	___
K	TUNA	1	1	1	1	1	1	___
I	SWORD FISH	1	1	1	1	1	1	___
N	SHRIMP	1	1	1	1	1	1	___
D	OTHER NON-REEF FISH	1	1	1	1	1	1	___
S								
	CHARTER/HEAD BOAT ACTIVITY**	1	1	1	1	1	1	X

341:372 407:436 438:470 807:838 838:870 807:836 707:770

(* TO BE USED ONLY IF RESPONDENT OWNS 2 OR MORE BOATS - REFER TO Q.2b.)

(** THIS ACTIVITY IS NOT ELIGIBLE FOR A GREEN QUESTIONNAIRE.)

IF LESS THAN 3 MAIN CATCHES RANKED IN Q.6d AND NO CHARTER BOAT ACTIVITY, SKIP TO Q.8a.

7. **(WRITE IN BELOW EACH MAIN CATCH/ACTIVITY OF THE SAMPLE BOAT FOR WHICH A GREEN QUESTIONNAIRE WAS NOT COMPLETED. FOR EACH ONE ASK:)** During which months of 1993 was (KIND IN Q.6d) the boat's main or primary catch? **(CIRCLE BELOW)**

	Month(s) Fished												
OTHER MAIN CATCH	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
_____ 771:772	01	02	03	04	05	06	07	08	09	10	11	12	773:796
_____ 797:798	01	02	03	04	05	06	07	08	09	10	11	12	807:830
_____ 831:832	01	02	03	04	05	06	07	08	09	10	11	12	833:856
CHARTER/HEAD BOAT ACTIVITY 881:882	01	02	03	04	05	06	07	08	09	10	11	12	857:880

8a. What is the boat's length? #_____feet 883:885

b. Of what material is its hull made?
Wood 1
Steel 2
Fiberglass 3
Other (SPECIFY): 4
_____ 886 887:888

c. What is the total horsepower of the main engine(s)? #_____hp. 889:893

d. What type of fuel does the main engine use?
Diesel 1
Gasoline 2
894

e. How much fuel does the boat's tank hold? #_____gallons 895:899

f. What is the total capacity of the boat's onboard fish boxes? #_____pounds 907:912

9a. In what year was this boat built? _____ 913:916

b. In what year did you (the owner) purchase it? _____ 917:920

10a. **(SHOW CARD G)** Which, if any, of these types of electronic equipment are on board this boat? **(CIRCLE BELOW UNDER COL.10a)**

b. **(FOR EACH TYPE CIRCLED IN Q.10a, ASK:)** How many (TYPE) are on board this boat? **(RECORD BELOW UNDER COL.10b)**

	(10a)	(10b)			(10a)	(10b)	
Loran-C	1	_____	921,922:923	Singleside Band Radio	1	_____	924,925:926
Plotter	1	_____	927,928:929	406 EPIRB	1	_____	930,931:932
GPS	1	_____	933,934:935	Cellular phone	1	_____	936,937:938
Paper Recorder	1	_____	939,940:941	Computer	1	_____	942,943:944
LCD Fish Finder	1	_____	945,946:947	Weatherfax	1	_____	948,949:950
ColorScope	1	_____	951,952:953	Other (SPECIFY):	1		954
Radar	1	_____	955,956:957	_____		_____	958:959,960:961
VHF Radio	1	_____	962,963:964	_____		_____	965:966,967:968

11a. **(SHOW CARD H AND FOR EACH LISTED ITEM, ASK:)** How much was spent on this boat during 1993 for (ITEM)? You may find it necessary to refer to your records. Only include routine expenses during 1993. Do not include the cost of new equipment, replacement of old equipment or gear.

	Item	Dollar Amount Spent	
(a)	Routine maintenance of hull	$_____	969:974
(b)	Routine maintenance of engines	$_____	975:980
(c)	Routine maintenance of fishing gear (exclude gear lost) and electronics	$_____	981:986
(d)	Payments on long-term debt for this boat and its equipment (principal & interest)	$_____	987:992
(e)	Payments on other business loans (principal & interest)*	$_____	993:998
(f)	Social security and unemployment compensation payments for this boat's captain and owner	$_____	1007:1012
(g)	State fishing licenses/permits	$_____	1013:1018
(h)	Federal fishing licenses/permits	$_____	1019:1024
(i)	Annual docking fees	$_____	1025:1030
(j)	Membership fees*	$_____	1031:1036
(k)	Legal and accounting fees*	$_____	1037:1042
(l)	Office expenses such as rent, telephone, utilities*	$_____	1043:1048
(m)	Property taxes relating to this boat and fishing equipment	$_____	1049:1054
(n)	Income taxes (Federal, State and local) relating to this boat's fishing activities	$_____	1055:1060
	Other (SPECIFY):_____	$_____	1061:1062, 1063:1066

(* Allocate sample boat's share.)

b. Is this boat leased? Yes 1 1069
No 2 (12)

c. What is the annual leasing charge for this boat? $_____ per year 1070:1075

12. Now let's talk about costs during 1993 for major hull repairs, new gear and equipment and replacement of worn out or lost gear and equipment.

a. **(SHOW CARD I)** Which, if any, of the following types of costs did this boat incur during 1993? **(CIRCLE BELOW UNDER COL.12a).)**

b. **(FOR EACH COST TYPE CIRCLED IN Q.12a, ASK:)** What was the total cost of repairing/replacing/purchasing this boat's (COST TYPE) during 1993? **(RECORD BELOW UNDER COL.12b)**

c. **(FOR EACH COST TYPE CIRCLED IN Q.12a, ASK;)** How many times has (COST TYPE) occurred for this boat in the past 10 years? **(RECORD BELOW UNDER COL.12c)**

Cost Type	(12a) 1993	(12b) Purchase Price/ Replacement Cost	(12c) Frequency	
Major hull repairs	1	_____	_____	1076:1084, 1085:1090, 1091:1092
New/rebuilt engine	1	_____	_____	1093:1098, 1107:1106
Anchor/chains/rope	1	_____	_____	1109:1114, 1115:1116
Hydraulic/electric/bandit reels	1	_____	_____	1117:1122, 1123:1124
Nets	1	_____	_____	1125:1130, 1131:1132
Traps	1	_____	_____	1133:1138, 1139:1140
Equipment required by the USCG	1	_____	_____	1141:1146, 1147:1148
Other safety equipment	1	_____	_____	1149:1154, 1155:1156
Other (SPECIFY):	1			1157
_____	1158:1159	_____	_____	1160:1165, 1166:1167

13a. Do you have any type of insurance coverage for this boat? Yes 1 (13b) 1168
No 2 (13e)

b. **(FOR EACH LISTED TYPE, ASK:)** What was your 1993 coverage on this boat for (TYPE) insurance? **(RECORD BELOW UNDER COL.13b)**

c. **(FOR EACH LISTED TYPE, ASK:)** What was your 1993 deductible for (TYPE) insurance? **(RECORD BELOW UNDER COL.13c)**

d. **(FOR EACH COVERAGE, ASK:)** How much did the coverage for (TYPE) cost in 1993? **(RECORD BELOW UNDER COL.13d)**

Type	(13b) Dollar Coverage	(13c) Deductible	(13d) Cost	
Hull plus P&I	$_____	$_____	$_____	1169:1178, 1177:1182, 1183:1187
P&I only	$_____	$_____	$_____	1188:1195, 1207:1212, 1213:1217
Other (SPECIFY):				
_____ 1218:1219	$_____	$_____	$_____	1220:1227, 1228:1233, 1234:1238

e. Do you have health/medical insurance for your family? Yes 1 1239
No 2 (14a)

f. Are these premiums totally dependent on your commercial fishing income? Yes 1 1240
No 2

14a. What is your (the owner's) total investment in this boat? **Be sure to include in the estimate what was paid for it, any one-time cost to make the boat seaworthy if it was in bad shape, the gear and electronics on board, and any required Coast Guard equipment you have had to purchase.**

$_____ 1241:1248

b. If this boat with its gear and electronics was to be sold today, how much do you believe it would sell for? $_____ 1249:1256

c. If you were to buy now a brand new boat, essentially the same as this one, including the same electronics and fishing gear, how much do you believe you would have to pay for it? $_____ 1257:1264

IF ONLY ONE MAIN/PRIMARY CATCH CIRCLED IN COL. 1993 UNDER Q.6b OR Q.6c, SKIP TO Q.16a.

15a. **(REFER BACK TO Q.6 GRID)** You mentioned earlier that you fished for (KINDS CIRCLED IN COL.1993 UNDER Q.6b, OR Q.6c). Did you incur any costs whatsoever when switching from one kind of fishing to another? Such additional costs might include refitting the boat with different gear, new hooks, extra transportation, lodging costs, lost fishing days and the like.

Yes 1 (15b) 1265
No 2 (16a)

b. **(SHOW CARD D)** Which switches in the boat's main or primary catch incurred such additional costs in 1993? **(RECORD BELOW UNDER COL.15b)** Be sure to also include any instances when you switched back to a previous main catch later on in the year.

c. **(FOR EACH CHANGE IN COL.15b, ASK:)** How many fishing days, if any, did the boat lose in 1993 when it went from (KIND) to (KIND)? **(RECORD BELOW UNDER COL.15c)**

d. **(FOR EACH CHANGE IN COL.15b, ASK:)** What do you estimate the out-of-pocket cost was for changing from (KIND) to (KIND)? Do not forget refitting costs, lost net income from lost fishing days, extra transportation/lodging costs and the like. **(RECORD BELOW UNDER COL.15d)**

(15b)		(15c)	(15d)	
From Kind of Fish	To Kind of Fish	No. Days Lost	Switching Cost	
_____ 1266:1267	_____ 1268:1269	_____ 1270:1271	$_____	1272:1278
_____ 1277:1278	_____ 1279:1280	_____ 1281:1282	$_____	1283:1287
_____ 1288:1289	_____ 1290:1291	_____ 1292:1293	$_____	1294:1298
_____ 1307:1308	_____ 1309:1310	_____ 1311:1312	$_____	1313:1317

16a. Do you have any other employment or do any work other than on a commercial fishing boat?

Yes 1 (16b) 1318
No 2 (17a)

b. What other employment or work do you do? Consider all shore based work including seafood wholesaling or retailing, if applicable. **(RECORD BELOW UNDER COL.16b)**

c. **(FOR EACH TYPE IN Q.16b, ASK:)** Is that full-time or part-time work? **(CIRCLE BELOW UNDER COL.16c)**

d. **(FOR EACH TYPE IN Q.16b, ASK:)** During which months of the year do you do (TYPE)? **(CIRCLE BELOW UNDER COL.16d)**

(16b)	(16c) -- Type --		(16d) ---------- Months ----------											
Other Employment/Work	FT (24+ hrs.)	PT (<24 hrs.)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
_____	1	2	1	1	1	1	1	1	1	1	1	1	1	1 1319:1333
_____	1	2	1	1	1	1	1	1	1	1	1	1	1	1 1334:1348

17a. How many other members besides yourself are there in your household? #_____members 1349:1350

b. **(IF 1 OR MORE IN Q.17a, ASK:)** How many, if any, of these other members are employed? #_____employed 1351:1352

c. **(IF 1 OR MORE IN Q.17b, ASK:)** How many other household members, if any, work for or with you in your commercial fishing business? #_____members 1353:1354

18a. What was your 1993 gross revenue for the boat selected for this survey? Please include sales of all fish and shellfish caught by this boat in 1993. $_____ 1355:1361

b. What was the net income before taxes you cleared from this boat in 1993? $_____ That is, the difference between this boat's gross revenue minus all fishing expenses including crew share. 1362:1368

19a. **(SHOW CARD J AND ASK:)** What was your 1993 total household income before taxes? That is, the net income you personally got from all commercial fishing, all income you receive from other sources as well as income earned by other household members. Just give me the letter code for the group in which it falls.

CODE:_____ Don't know 0 1369:1370

b. How did the 1993 total household income before taxes breakdown percentagewise by these three sources? **(READ LIST)**

Commercial reef fishing..... ____ 1371:1373

Other commercial fishing..... ____ 1374:1376

All other sources..... ____ 1377:1379

MUST ADD TO:----------> 100%

c. What dollar amount do you have to clear each year from commercial fishing for you to continue to be a commercial fisherman? $_____ 1380:1385

20a. Where is your current residence? Just give me the county, state and ZIP code.

_____ (COUNTY) _____ (STATE) _____ (ZIP) 1386:1387, 1388:1389, 1390:1394

b. How long have you lived in (COUNTY) county? #_____years 1395:1396

21. What was the last grade of school you completed? 1397

Grade school (1-8) 1
Some high school (9-11)..... 2
High school graduate (12) 3
Vocational/technical school graduate 4
Some college 5
College graduate and more..... 6

22. How old are you? #_____years old 1398:1399

Finally ...

23a. Which of the following types of regulations, if any, have affected the amount of money you would otherwise spend on boat maintenance or fishing equipment? **(CIRCLE BELOW UNDER COL.23a)** None 0 **(24)**

b. **(FOR EACH TYPE CIRCLED IN COL.23a, ASK:)** Are you spending, more or less? **(CIRCLE BELOW UNDER COL.23b)**

c. **(FOR EACH TYPE CIRCLED IN COL.23a, ASK:)** By how much? **(RECORD BELOW UNDER COL.23c)**

d. **(FOR EACH TYPE CIRCLED IN COL.23a, ASK:)** Specifically, what is it about **(TYPE)** regulation that caused this increase/decrease in cost? **(RECORD BELOW UNDER COL.23d)**

Type of Regulation	(23a) Affected Expenditure	(23b) Change: More	Less	(23c) Change In Amount	(23d) Reasons
Federal	1	1	2	$_____	
	1407	1408		1409:1413	1414:1423
U.S. Coast Guard	1	1	2	$_____	
	1424	1425		1426:1430	1431:1440
State	1	1	2	$_____	
	1441	1442		1443:1447	1448:1457
Other (SPECIFY): _____	1	1	2	$_____	
1458:1459	1460	1461		1462:1466	1467:1476

1477

24. As a result of Federal fishing regulations are you spending more, less or about the same amount of time to improve boat safety?

More 1
Less 2
Same 3
Don't know 4

1478

Comments:_____

_____ 1479:1488

_____

25. What changes, if any, have you made to your fishing activities, since the various Federal snapper-grouper fishery regulations came into effect?

_____ 1489:1498

_____

_____

26. Since these Federal snapper-grouper regulations came into effect, how many times on average per year, if at all, have you fished in weather that you normally would not have?

#_____times per year 1907:1908

27a. Are you familiar with the Federal wreckfish ITQ program? Yes.....1 1810
No.....2 (28)

b. What is your opinion of it?_____ 1811:1820

_____

_____

28. Which, if any, of the following forms of Federal limitations on fishing efforts would you favor to better manage the reef fishery? You can select as many as you want. **(READ LIST)**

Limit the number of boats.....1 1821:1827
Limit the number of fishing days.....1
Limit the vessel's size.....1
Limit the size and/or number of fishing gear.....1
Limit the catch per trip.....1
Use of seasonal closures.....1
Something else (SPECIFY):.....1

_____ 1828:1829

Comments:_____ 1830:1839

_____

_____

29. What else do you have to say or add? _____ 1840:1849

_____

_____

END TIME:_____

Thank you!

ID #:_____

CROSSLEY SURVEYS
275 Madison Avenue
New York, NY 10016

SOUTH ATLANTIC/FLORIDA KEYS COMMERCIAL FISHERMEN SURVEY
(Green Supplemental Questionnaire)

#444-360/61
NA47FF0014
June, 1994

Respondent:_____ Vessel Registration No.:_____
1607:1616

1. **ENTER SPECIFIC NAME(S) OF MAIN/PRIMARY CATCH FROM COL.1993 UNDER Q.6b, Q.6c OR Q.6d:**
_____ 1617:1626

READ
All of the following questions will only pertain to the boat selected for this survey and its commercial fishing trips where (KIND IN Q.1) was the main or primary catch.

2a. What was the boat's principal port in 1993 when (KIND IN Q.1) was the main or primary catch?

_____ (CITY) 1627:1629 _____ (STATE) 1629:1630

b. What was the boat's average crew size, including the captain, when (KIND IN Q.1) was the main or primary catch? #_____ 1631:1633

3a. During which months of 1993 was (KIND IN Q.1) the boat's main or primary catch? **(CIRCLE BELOW UNDER COL.3a)**

b. **(FOR EACH MONTH CIRCLED IN Q.3a, ASK:)** How many trips did the boat take for (KIND IN Q.1) during (MONTH) in 1993? **(RECORD BELOW UNDER COL.3b)**

c. **(FOR EACH MONTH CIRCLED IN Q.3a, ASK:)** How many days on average was the boat's typical trip for (KIND IN Q.1) during (MONTH)? **(RECORD BELOW UNDER COL.3c)** Be sure to count from the time the boat left the dock to the time of its return.

Months	(3a) Fished	(3b) No. of Trips	(3c) No. of Days		Months	(3a) Fished	(3b) No. of Trips	(3c) No. of Days	
Jan	1	_____	_____	1634:1638	Jul	1	_____	_____	1639:1643
Feb	1	_____	_____	1644:1648	Aug	1	_____	_____	1649:1653
Mar	1	_____	_____	1654:1658	Sep	1	_____	_____	1659:1663
Apr	1	_____	_____	1664:1668	Oct	1	_____	_____	1669:1673
May	1	_____	_____	1674:1678	Nov	1	_____	_____	1679:1683
Jun	1	_____	_____	1684:1688	Dec	1	_____	_____	1689:1693

4a. **(SHOW CARD C)** What gear did the boat usually have on board in 1993 when fishing commercially for (KIND IN Q.1)? Include any gear that was not used for this type of fishing. **(RECORD BELOW UNDER COL.4a)**

b. What gear on board this boat was used when fishing commercially for (KIND IN Q.1)? Be sure to also include what was used for the incidental catch. **(RECORD BELOW UNDER COL.4b)**

	(4a)	(4b)
Bottom long lines	1	1
Bandit reels (including electric & hydraulic)	1	1
Surface long lines	1	1
Hand held electric reels	1	1
Sea bass traps/pots	1	1
Other fish traps/pots	1	1
Gill nets	1	1
Spear fishing (w/o power heads)	1	1

1713:1720 1721:1728

	(4a)	(4b)
Spears w/power heads	1	1
Lobster/crab traps	1	1
Trolling lines	1	1
Rod & reel	1	1
Shrimp trawls	1	1
Other (SPECIFY):	1	1

_____
1694:1699 1707:1712

1729:1734 1735:1741

5a. **RECORD BELOW ON THE FIRST LINE UNDER COL.5a/b THE MAIN CATCH FROM Q.1.**

b. **(SHOW CARD D)** Think of a typical commercial fishing trip during 1993 when (KIND IN Q.1) was this boat's main or primary catch. What other kinds of fish made up the usual incidental kept catch? You might want to refer to your log book or records to select a typical trip. **(RECORD SPECIFIC NAMES BELOW UNDER COL.5a/b)**

1742 = BLANK

c. What was the average total poundage of fish brought to the dock and sold per trip in 1993 by this boat when (KIND IN Q.1) was the main catch and (INCIDENTAL KINDS LISTED UNDER COL.5a/b) were the incidental catch?

_____lbs. per trip 1743:1748

d. **(FOR EACH KIND OF FISH LISTED UNDER COL.5a/b, ASK:)** How many of these pounds were (KIND)? **(RECORD BELOW UNDER COL.5d)**

e. What was the average total revenue received per trip in 1993 when (KIND IN Q.1) was the main catch and (INCIDENTAL KINDS LISTED UNDER COL.5a/b) were the incidental catch landed from this boat? Do not deduct any unloading or packing fees.

$_____ per trip 1749:1753

f. **(FOR EACH KIND OF FISH LISTED UNDER COL.5a/b, ASK:)** What was the average price per pound you received for (KIND)in 1993? Do not deduct any unloading or packing fees. **(RECORD BELOW UNDER COL.5f)**

MULTIPLY VALUES IN 5d BY THOSE IN 5f AND ADD THEM UP. HAVE RESPONDENT LOOK AT TOTAL OF REVENUE COLUMN AND AMOUNT IN Q.5e. DETERMINE WHAT IS THE MOST ACCURATE AMOUNT AND ADJUST ACCORDINGLY.

g. **(FOR EACH KIND OF FISH LISTED UNDER COL.5a/b, ASK:)** What percent of the (POUNDS IN 5d) of (KIND) were usually caught per trip in Federal waters? **(RECORD BELOW UNDER COL.5g)**

	(5a/b) All Catches		(5d) Average Pounds Per Trip		(5f) Average Price Per Pound		Average Revenue (5d x 5f)		(5g) Average % In Federal Waters	
Main:	_____	1750:1757	_____	1758:1762	_____	1763:1767	$_____	1768:1774	_____	1775:1777
	_____	1778:1779	_____	1780:1784	_____	1785:1788	$_____	1790:1796	_____	1797:1799
Incidental:										
	_____	1807:1808	_____	1809:1813	_____	1814:1818	$_____	1819:1825	_____	1826:1828
	_____	1829:1830	_____	1831:1836	_____	1836:1840	$_____	1841:1847	_____	1848:1850
	_____	1831:1852	_____	1853:1857	_____	1858:1862	$_____	1863:1869	_____	1870:1872
	_____	1873:1874	_____	1875:1879	_____	1880:1884	$_____	1885:1891	_____	1892:1894
	_____	1895:1906	_____	1907:1911	_____	1912:1916	$_____	1917:1923	_____	1924:1926
	_____	1927:1928	_____	1929:1933	_____	1934:1938	$_____	1939:1945	_____	1946:1948
	_____	1949:1950	_____	1951:1956	_____	1956:1960	$_____	1961:1967	_____	1968:1970
	TOTAL ------->:		_____	1971:1977	TOTAL ------->:$		_____	1978:1984		

h. Are you usually charged unloading and packing fees? Yes 1 / No 2 (6a) 1985

i. What are the usual unloading and/or packing fees deducted from the sale of your catch? _____cents per pound / Don't know 0 1986:1988

j. Your average total unloading and/or packing fee in this case would be (CENTS IN Q.5i) times (POUNDS IN Q.5c) for a total of ..... (DO CALCULATION) $_____ 1989:1995

6a. What was the usual condition of (KIND IN Q.1) landed on the dock from this boat on those trips in 1993 when (KIND IN Q.1) was the main or primary catch? Gutted, but head on.....1 / Whole, as caught.....2 / Cored/plugged (no head, tail or guts).....3 1996

b. To what type of buyer do you normally sell your reef fish when you fish for (KIND IN Q.1)?

Retailer/restaurant 1
Wholesaler/processor 2
Other (SPECIFY): 3

_____ 1996:1999

7a. How many gallons of fuel did the boat use on average per trip during 1993 when (KIND IN Q.1) was the main or primary catch?

#_____gallons per trip 2007:2011

b. What was the boat's average fuel cost per trip in 1993 when fishing commercially for (KIND IN Q.1)?

$_____per trip 2012:2016

8a. How many pounds of ice on average did the boat take on board per trip in 1993 for this kind of fishing?

#_____pounds per trip 2017:2022

b. What was the average cost for ice per trip in 1993?

$_____per trip 2023:2029

c. (IF "NO COST," ASK:) How do you get your ice?

Own an ice machine 1
Lease an ice machine 2
Given to me free 3

2030

9a. How many pounds of bait on average did the boat take on board per trip in 1993 for this kind of fishing?

#_____pounds per trip 2031:2035

b. Which kind of bait did you usually use on this boat in 1993 when fishing commercially for (KIND IN Q.1)?

Frozen squid 1
Cigar minnows 1
Other (SPECIFY): 1

_____ 2036:2036 2038:2042

c. What was the average cost for bait per trip in 1993?

$_____per trip 2043:2047

d. (IF "NO COST," ASK:) How do you get your bait? (MULTIPLE RESPONSES ARE ACCEPTABLE)

Fish for it 1
Given to me free 2
Other (SPECIFY): 3

_____ 2048 2049:2050

10. On a typical trip for (KIND IN Q.1) there is usually some gear loss like hooks, line, swivels, bungee cords, weights and the like. What was the average cost of this type of gear loss per trip in 1993 when fishing for (KIND IN Q.1)? Do not include occasional major gear losses such as reels, anchors and the like.

$_____per trip 2051:2055

11. What was the boat's average cost for food and beverages per trip for this kind of fishing?

$_____per trip 2056:2060

12a. On a typical trip for (KIND IN Q.1) what percent, if any, of the gross revenue does the captain get? That is, a percent before any trip expenses are deducted.

_____% None 0 2061:2063

b. On a typical trip for (KIND IN Q.1) what percent, if any, of the gross revenue does the boat get? That is, a percent before any trip expenses are deducted.

_____% None 0 2064:2066

13a. To learn how you determine captain, boat and crew shares, let's figure it out for the typical trip where (KIND IN Q.1) was the main catch and the usual revenue for the main and incidental catches was (AMOUNT IN Q.5e). **(RECORD AMOUNT IN Q.5e ON LINE 1)**

b. **(SHOW CARD F)** What, if anything, do you deduct before determining captain, boat and crew shares? **(LINES 2 THROUGH 10 UNDER (b))**

c. **FOR EACH ITEM CIRCLED IN Q.12b ENTER THE AMOUNTS FROM QUESTIONS 5j, 7b, 8b, 9c, 10 AND/OR 11 ON LINES 2 THROUGH 10 UNDER (c). (FOR OTHER LISTED ITEMS, ASK:)** How much was deducted for (ITEM)? **(FOR CAPTAIN'S/BOAT'S SHARE OF GROSS REVENUE APPLY PERCENTS IN Q.12a/b TO AMOUNT ON LINE 1 FOR AMOUNT TO BE ENTERED ON LINES 9 & 10.)**

d. **ADD AMOUNTS ON LINES 2 THROUGH 10 AND ENTER ON LINE 11.**

e. **RECORD THE DIFFERENCE BETWEEN LINE 11 AND LINE 1 ON LINE 12.**

f. What is the captain's share of the net revenues after deductions? **(ENTER THE AMOUNT ON LINE 13)**

g. What is the boat's share of the net revenues after deductions? **(ENTER THE AMOUNT ON LINE 14)**

h. What is the crew's share? **(ENTER THE AMOUNT ON LINE 15)**

WORKSHEET FOR Q.13

Line				(b.) Deduct	(c.) Amount		
1	(a.)	Typical revenue from Q.5				$_____	2067:2071
2		**DEDUCTIONS**	Unloading/packing fees (5j)	1	$_____		2072, 2073:2077
3			Fuel (Q.7b)	1	$_____		2078, 2079:2083
4			Ice (Q.8b)	1	$_____		2084, 2085:2089
5			Bait (Q.9c)	1	$_____		2090, 2091:2095
6			Gear loss (Q.10)	1	$_____		2096, 2107:2111
7			Food (Q.11)	1	$_____		2112, 2113:2117
8			Other (SPECIFY):	1	$_____		2118, 2119:2123
			_____	1	$_____		2124:2125, 2126, 2127:2131
			_____	1	$_____		2132:2133, 2134, 2135:2139
9			Captain's share of gross revenue (12a)	1	$_____		2140, 2141:2145
10			Boat's share of gross revenue (12b)	1	$_____		2146, 2147:2151
11	(d.)	**TOTAL DEDUCTIONS ----->**				$_____	2152:2156
12	(e.)	**Subtract d from a:**				$_____	2157:2161
13	(f.)	Captain's share of net			2162:2166	$_____	**MUST ADD**
14	(g.)	Boat's share of net			2167:2171	$_____	**TO LINE 12**
15	(h.)	Crew's share of net			2172:2176	$_____	**TOTAL**

14. Is a crewman's share based on what he, himself, actually caught or on some other basis?

What he caught 1 2177
Some other basis 2

GO OVER THE COMPLETED WORKSHEET WITH RESPONDENT. MAKE ANY ADJUSTMENTS THAT ARE NECESSARY. IF ANY CHANGES ON LINES 2-7 UNDER (c), MAKE CORRESPONDING CHANGES IN APPROPRIATE PRECEDING QUESTIONS.

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